Government of Canada
Canadian Forestry Service

Gouvernement du Canada
Service canadien des forêts

GREAT LAKES FORESTRY CENTRE
CENTRE FORESTIER DES GRANDS LACS

Results of forest insect and disease surveys in the EASTERN REGION of Ontario, 1987

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

A. Kelzer

Miscellaneous Report No. 81

Canada

THE GREAT LAKES FORESTRY CENTRE

The Great Lakes Forestry Centre is one of six regional establishments located across Canada and operated by the Canadian Forestry Service. The overall objective of the Service is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. The Centre pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

The Centre specializes in research in forest production, forest protection, forest environment and forest utilization. These programs deal directly with the issue of maintaining and enhancing the resource supply. Activities range from basic to applied and developmental research, and include a significant technology transfer component.

Major activities in forestry development include federal management responsibility for federal-provincial forest management agreements, participation in the National Forestry Statistics program and forest economics research.

Close working relationships are maintained with the Ontario Ministry of Natural Resources, the forest industry, educational institutions specializing in forestry and the biological sciences, and other forestry organizations within the province. The Centre is represented on the Ontario Forestry Council and the Ontario Forestry Research Committee, which have responsibility for coordinating forestry research in Ontario.

It is recognized that forested land must be managed in the best public interest, not only for the wood production essential to our economy, but also for the recreational purposes that are so important to our social well-being. This must be achieved in a manner that will maintain or improve the quality of the forest environment and preserve it for generations to come.

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE EASTERN REGION OF ONTARIO 1987

(FOREST DISTRICTS: NAPANEE, TWEED, CARLETON PLACE, CORNWALL AND BROCKVILLE)

GREAT LAKES FORESTRY CENTRE

CANADIAN FORESTRY SERVICE

GOVERNMENT OF CANADA

1988

MISCELLANEOUS REPORT NO. 81

92-05213/

©Minister of Supply and Services Canada 1988
Catalogue No. Fo 29-8/81E
ISBN 0-662-16245-5
ISSN 0832-7130

Copies of this publication are available at no charge from:

Communications Services
Great Lakes Forestry Centre
Canadian Forestry Service
Government of Canada
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

Microfiches of this publication may be purchased from:

Micromedia Inc.
Place du Portage
165, Hôtel-de-Ville
Hull, Quebec
J8X 3X2

SURVEY HIGHLIGHTS

The following report is a summary of surveys made of the insects, diseases and abiotic factors that affected forest trees in the Eastern Region in 1987. Included are forecasts for 1988 of populations of the most serious defoliators, i.e., gypsy moth and forest tent caterpillar.

The most important defoliator in the region since 1981 has been the gypsy moth. Between 1986 and 1987 there was a 93% decline in the area of moderate-to-severe defoliation caused by this pest, with only 11,564 ha affected in the latter year; egg-mass surveys indicate that populations will continue to decline in 1988. A total of 40,249 ha of crown and private land was aerially sprayed against the gypsy moth by the Ontario Ministry of Natural Resources (OMNR) in the Central, Algonquin and Eastern regions.

Moderate-to-severe defoliation by the forest tent caterpillar was mapped over 980 ha of primarily trembling aspen in Tweed and Carleton Place districts; egg-band surveys indicate that all areas infested in 1987 will be reinfested in 1988. Reductions in populations of the redheaded pine sawfly have occurred in each district. Moderate damage caused by the jack pine sawfly was evident in Brockville, Cornwall and Tweed districts. Increasing damage to sugar maple by the maple leafcutter occurred in Brockville, Carleton Place, Tweed and Napanee districts. Surveys for the pine false webworm also revealed increasing populations and associated damage in Carleton Place and Brockville districts.

Extensive aerial and ground surveys were conducted for scleroderris canker, with negative results.

A drier-than-average summer induced drought symptoms in hilltop trees and reduced the incidence levels of leaf diseases. Winter ice, wind and snow damaged many roadside and other exposed trees in Cornwall, Brockville and Carleton Place districts.

A number of special surveys were conducted in 1987. They included the evaluation of six white spruce plantations and the collection of 100 white spruce cones for the purpose of assessing insect and disease problems; the establishment and evaluation of 10 maple dieback plots for the purpose of assessing current and cumulative branch mortality; and checks for beech bark disease.

As in previous years, pests in this report are categorized as follows:

Major Insects/Diseases

Capable of causing serious injury to or death of living trees or shrubs

Minor Insects/Diseases

Capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

(1) those that are of minor importance and have not been shown to cause serious damage to forest trees;

(2) those that are capable of causing serious damage but, because of low populations or for other reasons, did not cause serious damage in 1987.

The generous assistance and cooperation of OMNR, Conservation Authorities, Parks Canada and the National Capital Commission (NCC) are gratefully acknowledged and appreciated.

A. Keizer

Frontispiece

Gypsy moth (*Lymantria dispar* [L.]) larvae killed by disease. Natural enemies play an important role in controlling insect populations.

TABLE OF CONTENTS

Page

INSECTS

Major Insects

Pine False Webworm, *Acantholyda erythrocephala* 1
(Brockville and Carleton Place districts)

Spruce Budworm, *Choristoneura fumiferana* 1
(All districts)

Birch Leafminer, *Fenusa pusilla* 4
(All districts)

Fall Webworm, *Hyphantria cunea* 4
(All districts)

Gypsy Moth, *Lymantria dispar* 4
(All districts)

Forest Tent Caterpillar, *Malacosoma disstria* 10
(Carleton Place and Tweed districts)

Balsam Fir Sawfly, *Neodiprion abietis* complex 14
(Carleton Place, Cornwall and Tweed districts)

Redheaded Pine Sawfly, *Neodiprion lecontei* 14
(Brockville, Carleton Place, Napanee and Tweed districts)

Jack Pine Sawfly, *Neodiprion pratti paradoxicus* 16
(Brockville, Carleton Place, Cornwall and Tweed districts)

European Pine Sawfly, *Neodiprion sertifer* 16
(Brockville and Tweed districts)

Bruce Spanworm, *Operophtera bruceata* 16
(Carleton Place District)

Maple Leafcutter, *Paraclemensia acerifoliella* 18
(Brockville, Carleton Place, Napanee and Tweed districts)

Minor Insects

Maple Trumpet Skeletonizer, *Epinotia aceriella* 18
(Brockville and Napanee districts)

(cont'd)

TABLE OF CONTENTS (cont'd)

Page

Sugar Maple Borer, *Glycobius speciosus* 18
(Brockville, Carleton Place and Napanee districts)

Eastern Tent Caterpillar, *Malacosoma americanum* 19
(All districts)

Imported Willow Leaf Beetle, *Plagioaera versicolora* 20
(All districts)

Willow Flea Weevil, *Rhynchaenus rufipes* 20
(All districts)

Other Forest Insects 20

TREE DISEASES

Major Diseases

Scleroderris Canker, *Asococalyx abietina* 26
(All districts)

Anthracnose, *Apiognomonia errabunda, Aureobasidium apocryptum, Gnomonia caryae* var. *caryae, Gnomonia leptostyla* 26
(All districts)

Eutypella Canker, *Eutypella parasitica* 28
(Brockville, Carleton Place and Napanee districts)

Minor Diseases

Balsam Poplar Leaf Diseases, *Marssonina populi, Marssonina populorum, Mycosphaerella populicola, Mycosphaerella populorum* 28
(All districts)

Leaf Spot Diseases, *Mycosphaerella effigurata, Stegaphora ulmea* 28
(All districts)

Other Forest Diseases 30

(cont'd)

TABLE OF CONTENTS (concl.)

Page

DIEBACKS AND DECLINES

Maple Dieback Survey 32
(Brockville, Carleton Place and Napanee districts)

Red Oak Decline 34
(Carleton Place District)

ABIOTIC DAMAGE

Frost Injury 34
(All districts)

Snow and Ice Damage 38
(Brockville, Cornwall and Carleton Place districts)

Drought 38
(Carleton Place and Tweed districts)

SPECIAL SURVEYS

White Spruce Plantation Survey 38
(Brockville, Carleton Place and Cornwall districts)

White Spruce Cone Collection 42
(Carleton Place District)

G. Howard Ferguson Forest Station 42
(Brockville District)

Pinewood Nematode, *Bursaphelenchus xylophilus* 43
(All districts)

Beech Bark Disease, *Nectria coccinea* var. *faginata* 43
(All districts)

Acid Rain National Early Warning System 44
(Brockville, Carleton Place and Tweed districts)

The Greenbelt Forest of the National Capital Commission . . 44
(Carleton Place District)

Climatic Data 46
(Carleton Place and Napanee districts)

INSECTS

Major Insects

Pine False Webworm, *Acantholyda erythrocephala* (L.)

Increasing numbers and wider distribution of this introduced pest were evident from the associated damage observed in pine plantations throughout Brockville and Carleton Place districts (see photo page).

Moderate-to-severe defoliation was evident in 60-100% of the trees in three of eight areas surveyed. Plantations in Ramsay and Fitzroy townships of Carleton Place District sustained damage to 100% of their red pine *(Pinus resinosa* Ait.). The Ramsay Township plantation averaged 92% foliar damage to 2.1-m trees over an area of 4.0 ha and the Fitzroy Township plantation averaged 63% defoliation of 1.3-m trees over an area of 1.0 ha. Less severe damage occurred in another red pine plantation in Ramsay Township, which sustained 25% defoliation over 60% of a 5-ha area. This plantation also contained three trees that were dead as a result of years of successive defoliation by this pest.

Defoliation estimates for five additional plantations surveyed remained low. These results are summarized in Table 1.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

There was a pronounced decline in the area of moderate-to-severe defoliation by this insect in 1987. Aerial and ground surveys revealed 7,189,763 ha of defoliation, a 19% decrease from the 8,855,687 ha defoliated in 1986. Most of this decline occurred in the eastern part of Hearst, Wawa and Terrace Bay districts of the Northern, Northeastern and North Central regions of Ontario. The present infestation remains in the North Central and Northwestern regions, where a small increase (approximately 50,000 ha) occurred in Ignace, Sioux Lookout and Red Lake districts (Fig. 1).

In an effort to protect high-value stands, OMNR aerially sprayed over 76,526 ha in the North Central Region and 293 ha in the Northwestern Region with *Bacillus thuringiensis (B.t.)*. The area within which balsam fir *(Abies balsamea* [L.] Mill.) mortality occurred has increased by 82,174 ha, for a total of 14,067,082 ha in Ontario to date.

Surveys in the Eastern Region revealed only trace levels of defoliation to primarily roadside hosts in Denbigh Township, Tweed District. Egg-mass surveys and pheromone trapping indicate that future populations of this serious pest will remain at low levels throughout most of the region in 1988.

Table 1. Results of surveys for the pine false webworm at eight locations in the Eastern Region in 1987 (counts based on the examination of 150 trees at each location).

Location (Twp)	Host	Avg ht of trees (m)	Estimated trees per ha	Estimated area affected (ha)	Trees affected (%)	Foliar damage (%)	Avg no. of web masses per tree
Carleton Place District							
Marlborough	rP	5.5	1,250	2.0	1	1	1
Fitzroy	rP	1.3	900	1.0	100	63	14
Darling	wP	1.8	1,800	2.5	1	1	1
Lanark	rP	2.0	600	1.0	4	1	1
Ramsay	rP	2.1	1,500	4.0	100	92	18
Ramsay	rP	1.8	1,000	5.0	60	25	1
Brockville District							
Oxford on Rideau	rP	1.2	1,050	3.0	9	1	1
Oxford on Rideau	rP	2.1	260	1.0	11	7	3

NORTHWESTERN ONTARIO

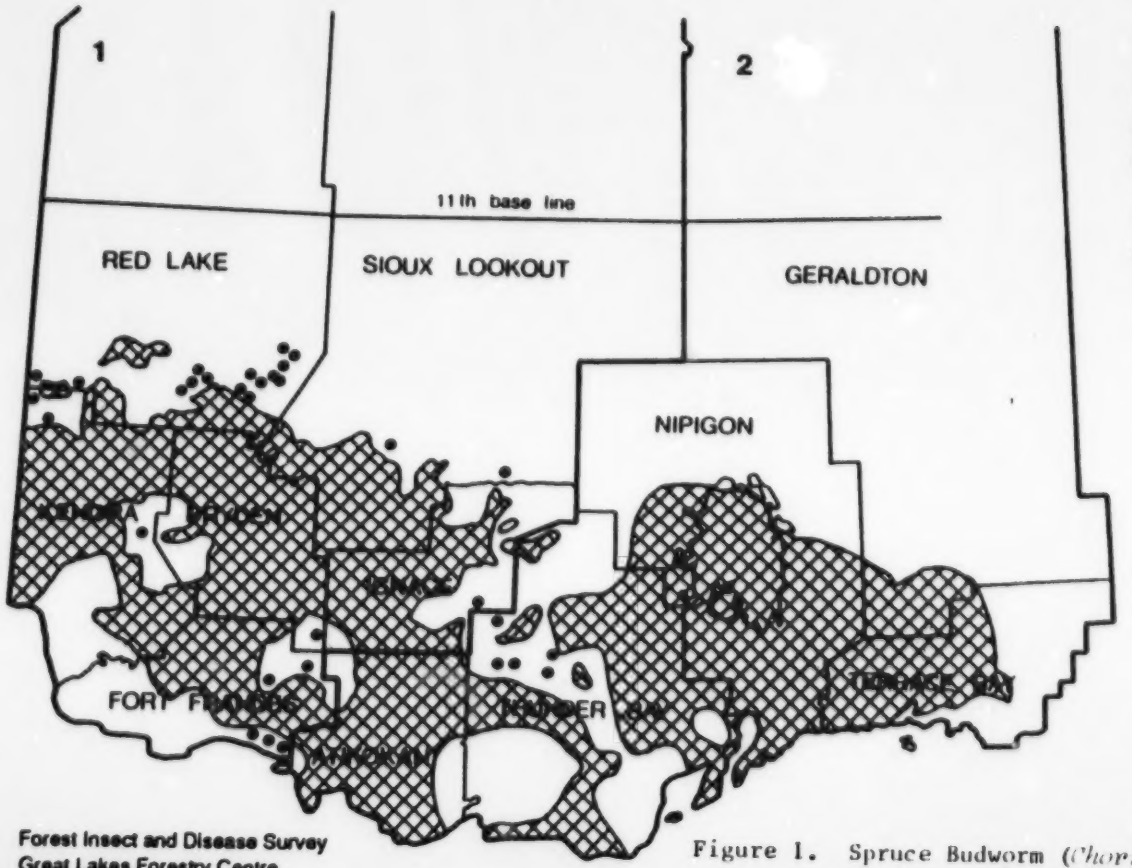


Figure 1. Spruce Budworm (*Choristoneura fumiferana* [Clem.])

Areas within which moderate-to-severe defoliation occurred during 1987

. . . . . or ●

Birch Leafminer, *Fenusa pusilla* (Lep.)

Various levels of foliar damage were observed discoloring ornamental and roadside birch (*Betula* spp.) througnout the region in 1987.

The highest density of damaged trees was aerially detected near the town of Perth in Carleton Place District, where 90% of a 10-ha birch stand displayed severe foliar browning. A 2-km stretch of 2-m to 4-m birch regeneration along Concession IV in Elizabethtown Township, Brockville District sustained 50% foliar damage. Scattered areas of birch up to 1 ha in size along both sides of Hwy 401 in Cramahe and Brighton townships, Napanee District, contained large populations of the leafminer and averaged 75% defoliation.

Fall Webworm, *Hyphantria cunea* (Dru.)

Lower numbers of this gregarious tent caterpillar were evident throughout the region in 1987. It was the first year that populations have decreased since a general outbreak began in 1980. Single roadside and fencerow trees containing one to ten webs each were still observed, however, and defoliation was as high as 90% (see photo page). Preferred hosts were black ash (*Fraxinus nigra* Marsh.), white elm (*Ulmus americana* L.) and cherry (*Prunus* spp.).

The highest densities of single infested trees were observed in Brockville District, where defoliation estimates ranged from 50 to 90% through the townships of Edwardsburgh, Oxford on Rideau, Rear of Leeds and Lansdowne, and Front of Yonge.

Large numbers of web-infested trees, with an average of five to ten webs per tree, were scattered through the Loughborough, Pittsburgh and Hallowell townships of Napanee District, and along Ottawa-Carleton County Road 25 in North Gower Township, Carleton Place District.

Tweed District was relatively web-free except in Huntingdon Township, where single roadside trees along Hwy 62 displayed 20 to 30% defoliation and averaged three to five webs per tree.

Gypsy Moth, *Lymantria dispar* (L.)

In 1987 there was a 93% decline in the area of moderate-to-severe defoliation in the Eastern Region, where only 11,564 ha of primarily oak stands were affected by this pest. This progressive decline began in 1986 when 166,974 ha were defoliated, a 32% reduction from 1985 (Fig. 2). Numerous scattered pockets are all that remain of the infestation, which covered 245,987 ha of forested land in 1985.

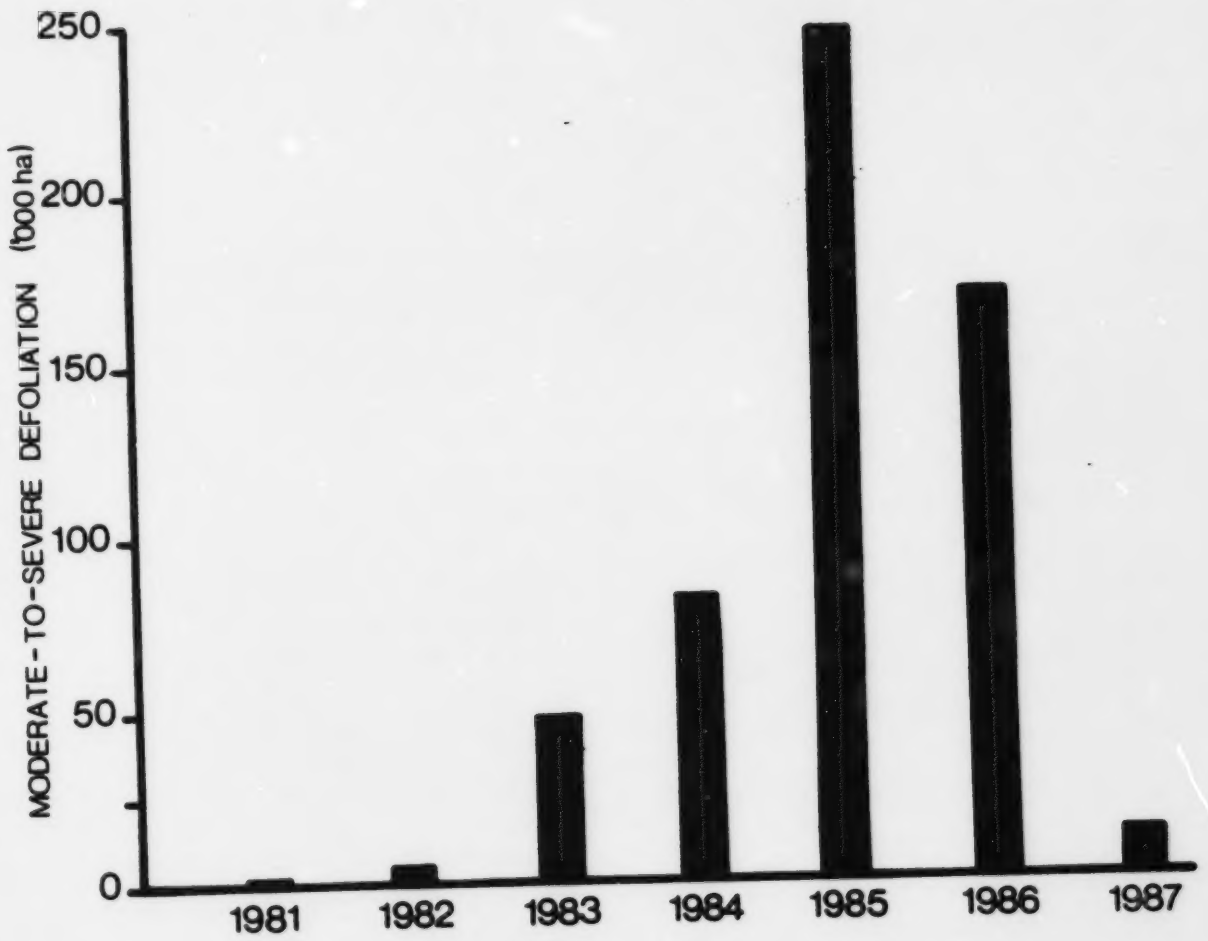


Figure 2. Yearly comparison of moderate-to-severe defoliation (>000 ha) caused by the gypsy moth (*Lymantria dispar* [L.]) in the Eastern Region from 1981 to 1987.

The single largest area of moderate-to-severe defoliation in 1987 occurred in Tweed District near Big Burnt Lake, where 1,787 ha were defoliated (Fig. 3). The gross area of moderate-to-severe defoliation in Tweed District declined from 73,525 ha in 1986 to 3,329 ha in 1987 (Tables 2 and 3). This defoliation occurred primarily in Madoc, Hungerford, Lake, Kaladar, Kennebec and Olden townships.

Similar reductions in population levels occurred in Napanee District. Of the 4,781 ha of infestation remaining, approximately 3,532 ha constitute newly infested areas, primarily in the western part of the district in Sidney, Murray, Brighton, Cramahe and Percy townships.

The eastern portion of the main 1986 infestation in South Crosby and North Crosby townships, Brockville District, receded in 1987. The area of moderate-to-severe defoliation decreased from 18,230 ha to 2,099 ha, and was located mainly in Rear of Leeds and Lansdowne and South Crosby townships.

The damage in Carleton Place District decreased and was restricted to scattered areas of moderate-to-severe defoliation that totaled 1,355 ha. Of the 11,500 ha of defoliation recorded in South Sherbrooke Township in 1986, only two small areas that totaled 112 ha remain. The largest infestation occurred in Darling and Pakenham townships and covered approximately 945 ha.

Howe Island in the St. Lawrence River was reinfested in 1987, and 175 ha of moderate-to-severe defoliation were detected A new isolated pocket of defoliation occurred over 65 ha of private forest on Grenadier Island.

Control Efforts

In an effort to suppress populations and minimize defoliation, OMNR aerially sprayed over 26,310 ha of crown land and 13,939 ha of private land in southern Ontario in 1987 with multiple applications of the bacterial insecticide *B.t.* This reduction from the 45,677 ha of crown and 57,417 ha of private land sprayed in 1986 occurred because of the tremendous reduction in the area of moderate-to-severe defoliation. The areas sprayed were in Brockville, Carleton Place, Napanee and Tweed districts of the Eastern Region; in Bancroft and Pembroke districts of the Algonquin Region; in Lindsay District of the Central Region; and in Simcoe District of the Southwestern Region.

Forecasts

Gypsy moth populations in 1988 have been predicted on the basis of egg-mass density surveys conducted by both OMNR and FIDS staff. Small numbers of egg masses suggest that the majority of the 395 loca-

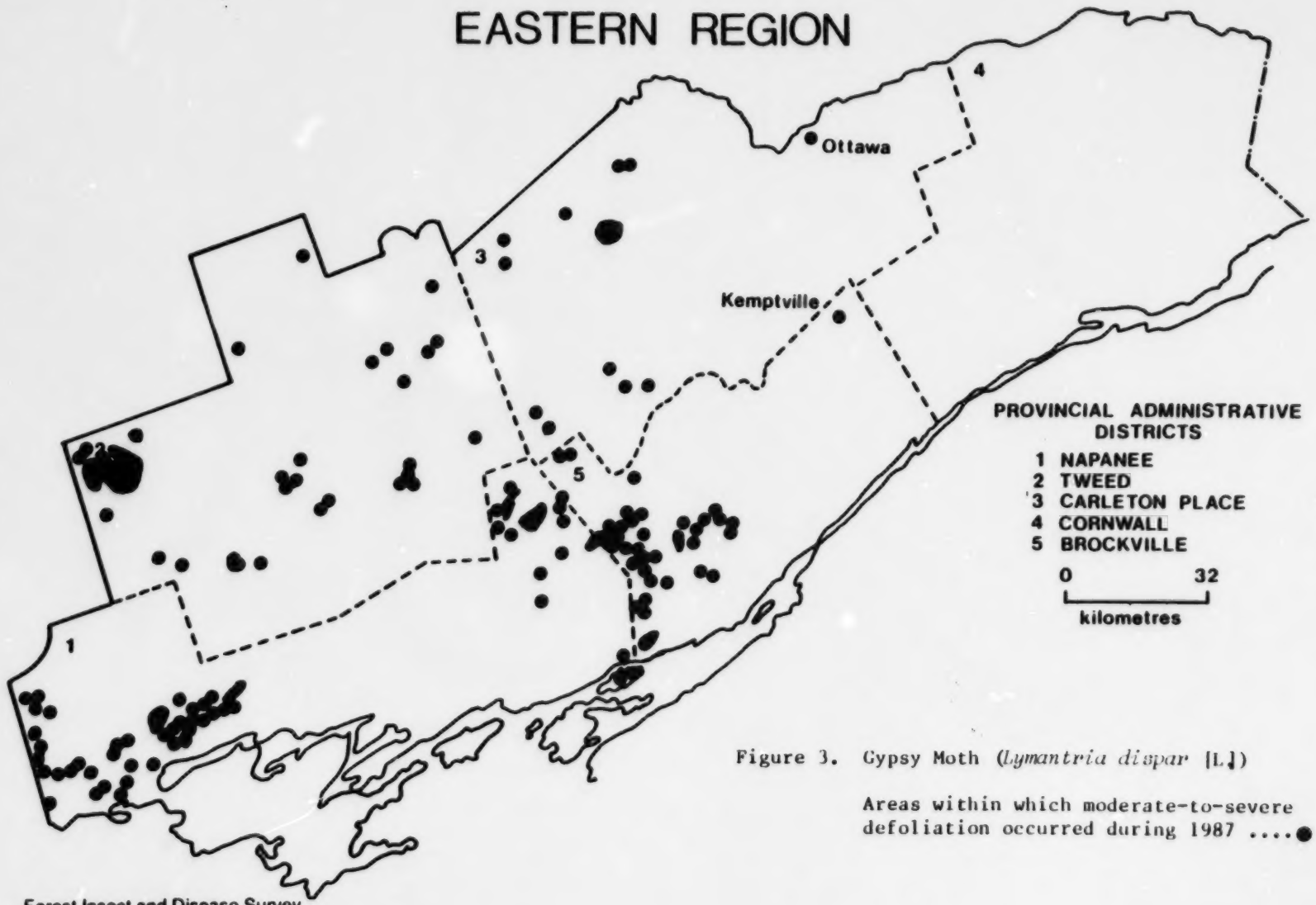


Figure 3. Gypsy Moth (*Lymantria dispar* [L.])

Areas within which moderate-to-severe defoliation occurred during 1987 ....●

Table 2. Gross area (ha) of moderate-to-severe defoliation by the gypsy moth in 1986 and 1987 (by district).

District	1986	1987	Change %	Change Area (ha)
Tweed	73,525	3,329	-96	-70,196
Napanee	57,780	4,781	-92	-52,999
Carleton Place	13,386	1,355	-90	-12,031
Brockville	22,283	2,099	-91	-20,184
Total	166,974	11,564	-93	-155,410

Table 3. Gross area (ha) of moderate-to-severe defoliation by the gypsy moth in 1986 and 1987 (by county).

County	Area (ha) 1986	Area (ha) 1987
Frontenac	109,442	1,775
Leeds	22,283	2,099
Lanark	13,356	1,355
Hastings	11,668	4,511
Lennox and Addington	8,627	407
Northumberland[a]	1,430	2,131
Prince Edward	540	0
Ottawa-Carleton	221	0
Total	167,567	12,279

[a] Areas include Lindsay District of the Central Region.

tions surveyed in the Eastern Region will have similar populations. Townships within which moderate-to-severe infestations are expected are listed in Table 4. The largest area of reinfestation in 1988 can be expected in the center of the region bordering the Tweed, Napanee, Carleton Place and Brockville districts in the vicinity of Big Rideau, Newboro, Charleston and Sharbot lakes. The northwest portion of Tweed District also contained high egg-mass densities at various sample points and moderate-to-severe defoliation can be expected during 1988.

Table 4. Locations of significant gypsy moth egg-mass densities, with population forecasts for 1988.

Location (Twp)	Population forecast for 1988
Brockville District	
Rear of Leeds and Lansdowne	severe
Front of Leeds and Lansdowne	moderate-to-severe
Rear of Yonge and Escott	severe
North Crosby	moderate-to-severe
South Crosby	moderate
Front of Yonge	moderate
Carleton Place District	
South Sherbrooke	moderate-to-severe
Darling	moderate-to-severe
Lavant	moderate-to-severe
Torbolton	moderate
Napanee District	
Sidney	moderate
Bedford	moderate-to-severe
Murray	severe
Tweed District	
Olden	moderate
Kaladar	moderate-to-severe
Lake	moderate
Elzevir	moderate
Clarendon	moderate
Sheffield	moderate-to-severe
Grimthorpe	moderate
Kennebec	moderate
Marmora	moderate-to-severe

The lower population levels and resulting defoliation that occurred through most of the region in 1987 can be partially attributed to natural increases in both viral and bacterial infections of larvae as a result of the *B.t.* spray program (see Frontispiece).

Larval Trapping

Once again, larval trapping with burlap strips was done with the cooperation of staff at 14 provincial parks in the Eastern Region. Larval counts were made on four specific days at each trap in an effort to establish quantitative relationships between larval densities, egg-mass densities, defoliation estimates and adult pheromone catches. Larval counts ranged from 0 in Rideau River Provinical Park to 2,135 in Sharbot Lake Provincial Park (Table 5). In the past, only the presence of larvae has been established at each park.

Adult Pheromone Trapping

In early July, prior to the gypsy moth adult flight period, two pheromone traps are deployed at each park, one at the entrance to the park and the second near an active campground or day-use area (see photo page). These traps are used to establish the presence and/or flights of the adult male moths. Captures were fewer in 1987, with an average of 16.2 moths per trap in comparison with 32.2 moths per trap in 1986 (Table 5).

Host Impact

Impact plots were established in 1982 throughout the region to monitor the effect on host trees of repeated defoliation by the gypsy moth. Twenty-six plots containing 14 different hosts were evaluated annually for variables such as growth increment, defoliation and mortality. A partial summary of the results is given in Table 6. To date, 30 of the 376 trees being monitored (8.6%) have died. Red oak (*Quercus rubra* L.) and white oak (*Q. alba* L.) have sustained the highest average defoliation over the six-year period. Red maple (*Acer rubrum* L.) has experienced less defoliation over the six-year period but has sustained the highest cumulative mortality, with 11% of 71 trees dead, whereas red oak has lost 7% of 186 trees and white oak only 2.9% of 69 trees.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Moderate-to-severe defoliation has not been detected aerially since the 1972-1978 infestation, which covered approximately 300,000 ha scattered through most of the Eastern Region during 1977. This year, three areas of severe defoliation totalling 980 ha were mapped in Carleton Place and Tweed districts (Fig. 4). The largest single area was located southwest of Bon Echo Provincial Park in Kaladar Township, Tweed District, where 70 ha of primarily trembling aspen were severely defoliated. Also in Tweed District, six scattered infestations totalling 192 ha were aerially mapped in Elzevir Township. Four smaller areas were also mapped along the March/Huntley Township line in Carleton Place District (see photo page).

Table 5. A summary of the results of gypsy moth burlap and pheromone trapping conducted in 14 parks in the Eastern Region during 1987.

Location (Provincial Park)	Burlap traps (10 per location)	Pheromone traps (two per location)[a]	
	Total no. of larvae	No. of male moths captured	
		1986	1987
Brockville District			
Charleston Lake	248	56	37
Carleton Place District			
Fitzroy	338	60	37
Murphy's Point	2	37	40
Rideau River	0	76	15[b]
Silver Lake	-[c]	84	44
Cornwall District			
Carillon	3	20	13
Jessup's Falls Cons. Area	50	-[d]	13
Napanee District			
Ferris	233	22	13[b]
Frontenac	185	171	16
Lake-on-the-Mountain	397	40	0[e]
Presqu'ile	116	42	44
Sandbanks	211	31	28
Tweed District			
Bon Echo	23	145	14[b]
Charbot Lake	2,135	287	28

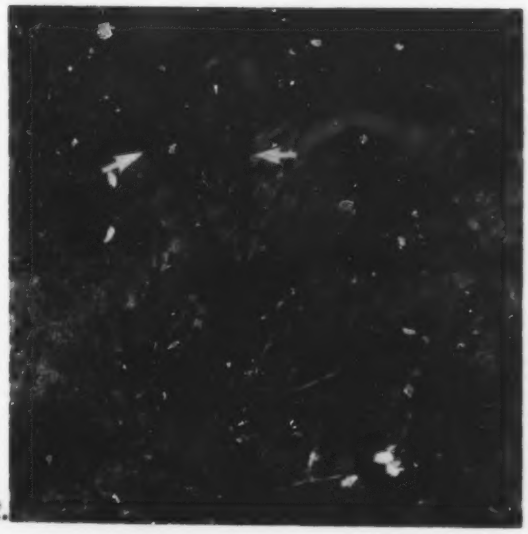
[a] USDA Deltoid stick-type
[b] one trap missing
[c] data missing
[d] not trapped
[e] two traps missing

Table 6. Summary of gypsy moth impact plots monitored between 1982 and 1987 in the Eastern Region.

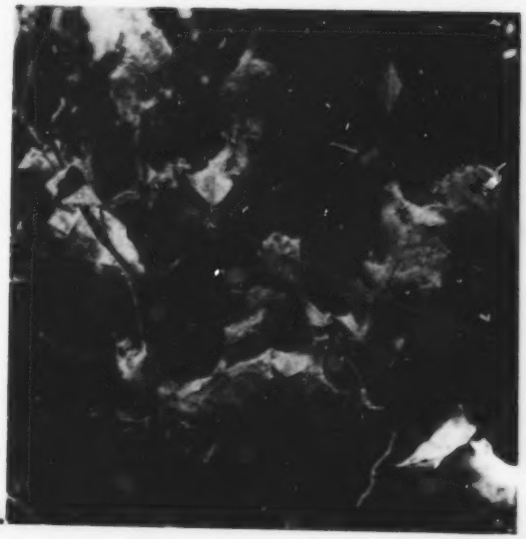
Tree species	1982			1983		1984		1985		1986		1987		Overall (1987)		
	No. alive	No. dead	Avg defol. (%)	No. Dead	Avg defol. (%)	No. Dead	Avg defol. (%)	No. Dead	Avg defol. (%)	No. Dead	Avg defol. (%)	No. Dead	Avg defol. (%)	Alive	Total no. dead 1982-1987	% dead
Red oak (*Quercus rubra* L.)	186	2	30	0	25	3	12	1	75	2	25	5	27	173	13	7
White oak (*Q. alba* L.)	69	0	41	0	34	0	18	1	57	1	17	0	22	67	2	2.9
Red maple, (*Acer rubrum* L.)	72	0	5	1	7	2	5	1	38	2	1	2	7	64	8	11.1
Sugar maple (*A. saccharum* Marsh.)	8	0	4	0	1	0	0	0	3	0	1	0	5	8	0	-
White ash (*Fraxinus americana* L.)	10	0	1	0	1	0	1	0	1	0	1	0	1	10	0	-
White birch (*Betula papyrifera* Marsh.)	10	0	1	0	3	1	35	0	33	0	1	3	4	6	4	40
Ironwood, (*Ostrya virginiana* [Mill.] K. Koch)	13	0	15	0	4	0	3	0	1	0	1	0	1	13	0	-
Others[a]	10	0	7	0	9	1	16	1	39	0	1	1	3	7	3	30

[a] trembling aspen (*Populus tremuloides* Michx.), eastern white pine (*Pinus strobus* L.), largetooth aspen (*Populus grandidentata* Michx.), white elm (*Ulmus americana* L.), butternut (*Juglans cinerea* L.), shagbark hickory (*Carya ovata* [Mill.] K. Koch), black cherry (*Prunus serotina* Ehrh.)

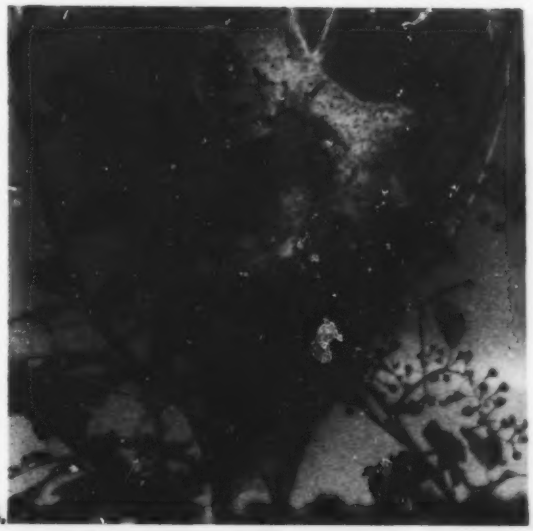
1.



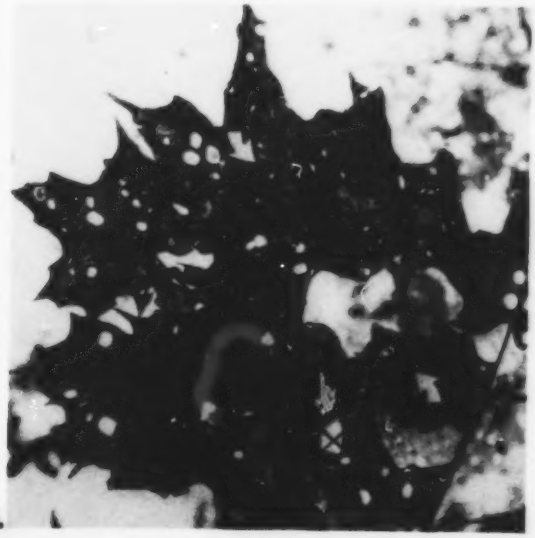
2.



3.



4.



5.

1. Forest tent caterpillar (*Malacosoma disstria* Hbn.), despite its name, does not make tents but rather silk-like mats for moulting and resting.
2. The pine false webworm (*Acantholyda erythrocephala* [L.]) can cause severe defoliation. Each branch contains at least one nest (arrows).
3. The fall webworm (*Hyphantria cunea* [Dru.]) is a common late-summer web maker on deciduous trees.
4. The eastern tent caterpillar (*Malacosoma americanum* F.) is commonly found on cherry and apple trees nesting in branch crotches.
5. The maple leafcutter (*Paraclemensia acerifoliella* [Fitch]) cuts circular discs from the leaves for moulting and feeding cases (arrows).

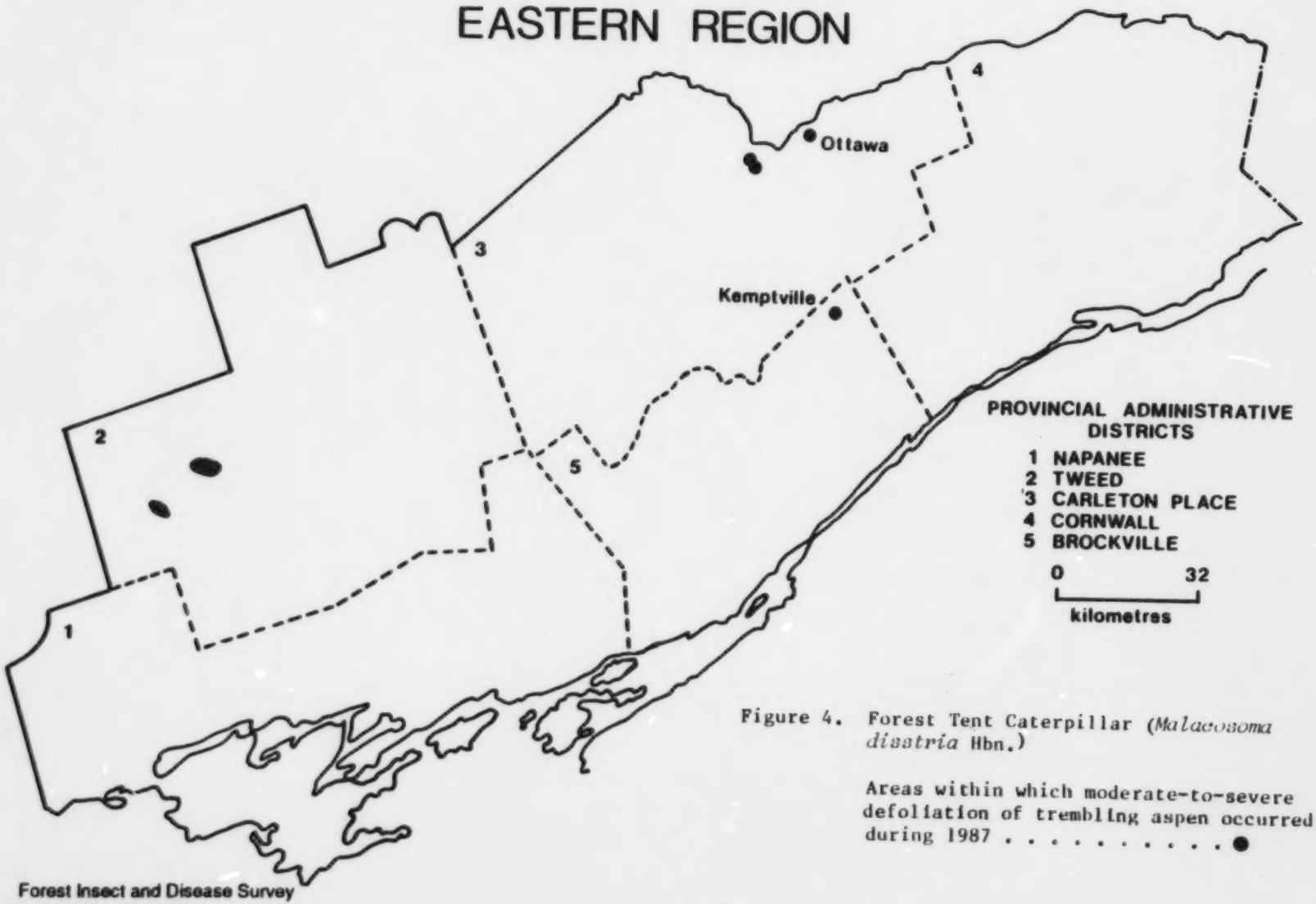


Figure 4. Forest Tent Caterpillar (*Malacosoma disstria* Hbn.)

Areas within which moderate-to-severe defoliation of trembling aspen occurred during 1987 . . . . . ●

Forecasts for 1988, on the basis of egg-band counts taken in 1987, are for a reinfestation and possible extension of all areas infested in 1987 (Table 7).

Table 7. Forest tent caterpillar egg-band samples collected from trembling aspen in two districts of the Eastern Region in 1987, and infestation level forecasts for 1988.

Location	Avg DBH of trees (cm)	No. of trees sampled	Avg no. of egg bands per tree	Infestation forecasts for 1988
Tweed District				
Elzevir Twp	16.7	3	6	moderate
Kaladar Twp				
V Conc. Rd.	23.0	1	53	severe
III Conc. Rd. N. of Flinton	15.8	3	7	moderate
III Conc. Near Deerock Lk.	18.0	1	31	severe
IV Conc. N. of Flinton	8.0	1	10	severe
Carleton Place District				
March/Huntley Twp Line	14.1	3	5	moderate

Balsam Fir Sawfly, *Neodiprion abietis* complex

There was an increase in populations and defoliation levels in 1987, particularly in Tweed District, where occasional roadside balsam fir trees commonly displayed 10-25% foliar damage. Two 1-ha areas of hillside trees sustained an average of 50% defoliation near Wickware Lake in Abinger Township. Single trees that exhibited 25 to 50% upper-crown defoliation were also detected in Silver Lake Provincial Park in Carleton Place District, along Lanark County Road #1 in Lanark Township, along Ottawa-Carleton County Road #19 in Osgoode Township, and along Hwy 43 in Mountain Township, Cornwall District.

Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

There was a slight reduction in the number of pine plantations damaged by this destructive pest in 1987. Damage estimates in seven red pine plantations across the region were low (Table 8).

Table 8. Summary of redheaded pine sawfly surveys at seven locations in the Eastern Region in 1987 (counts based on the examination of 150 trees).

Location (Twp)	Host	Avg ht of trees (m)	Estimated trees per ha	Estimated area affected (ha)	Trees affected (%)	Avg defoliation per tree (%)
Brockville District						
Rear of Yonge and Escott	rP	2.5	240	3	8	10
Carleton Place District						
Ramsay	rP	10.0	800	2	4	6
North Elmsley	rP	2.0	1000	1	8	9
Darling[a]	rP	2.5	3500	2	26	15
Tweed District						
Oso	rP	2.0	1000	3	10	15
Oso	rP	1.8	1000	10	2	2
Napanee District						
Portland	rP	1.2	1200	1	4	2

[a] sprayed with Malathion

The insecticide Malathion was applied over an area of 2.0 ha in one private plantation in Darling Township, Carleton Place District, where approximately 26% of 3,500 2-m-high red pine trees sustained an average of 15% foliar damage. A single ground application of this insecticide, carried out in cooperation with OMNR, reduced populations adequately.

Elsewhere, damage levels ranged from 2 to 15% on 2 to 10% of the trees examined.

Jack Pine Sawfly, *Neodiprion pratti paradoxicus* Ross

Heavy damage caused by this pest has been evident throughout the region since 1982.

Single open-grown and ornamental jack pine (*Pinus banksiana* Lamb.) and Scots pine (*P. sylvestris* L.) trees commonly sustained 100% needle loss (see photo page). A 3.0-ha jack pine plantation was severely defoliated in Augusta Township, Brockville District, where 100% of the 1.9-m trees sustained an average of 77% defoliation. In another plantation in Hungerford Township, Tweed District, 28% of the 2.6-m jack pine sustained an average of 31% foliar damage (Table 9).

Light defoliation ranging from 1 to 12% was observed during surveys of three plantations in Carleton Place District and one plantation in Cornwall District.

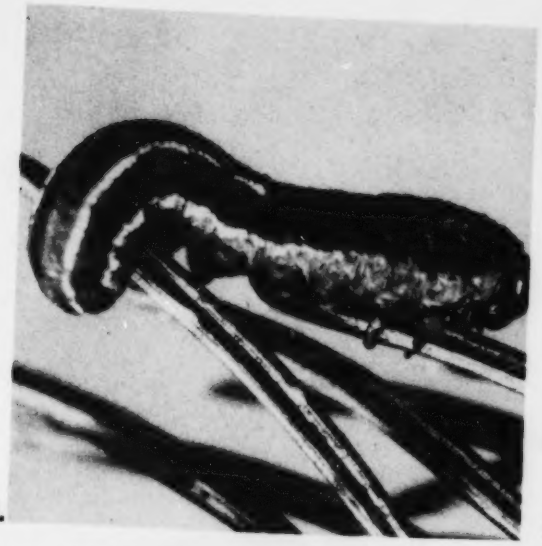
European pine sawfly, *Neodiprion sertifer* (Geoff.)

Low population levels were observed throughout the region in 1986 and again in 1987, with the following exceptions:

Two areas of perceptible damage occurred near Larkins in Hungerford Township, Tweed District: 69% of the 2.3-m-high trees in a 40-ha jack pine plantation sustained an average of 72% defoliation, and over 19% of the 1.9-m-high trees in an adjacent 45-ha plantation sustained an average of 21% defoliation. In a 3-ha red pine plantation assessed near Oxford Mills in Oxford on Rideau Township, Brockville District, 21% of the 1.2-m-high trees sustained an average of 6% foliar damage.

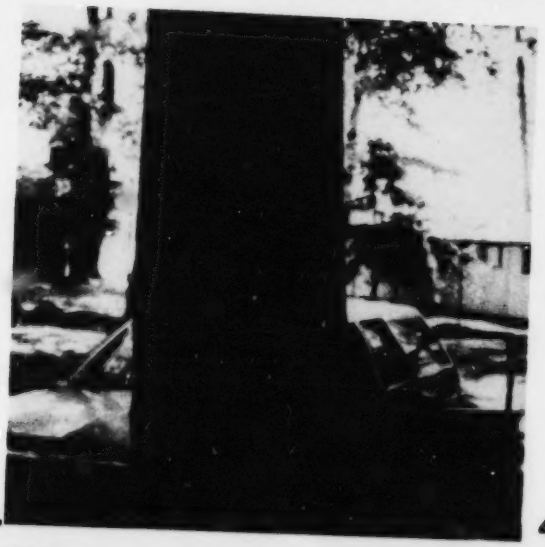
Bruce Spanworm, *Operophtera bruceata* (Hlst.)

Moderate-to-severe defoliation over 20 ha of primarily sugar maple was recorded in 1985 and 1986 in Pakenham Township, Carleton Place District. However, only light defoliation (1 to 4%) was noted in 1987.

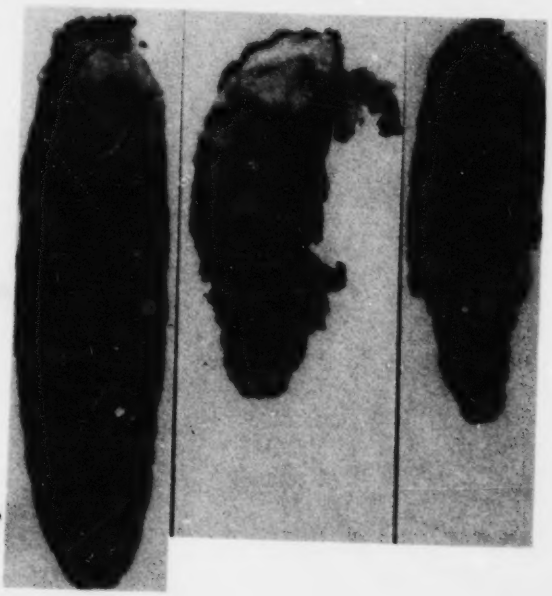


1.

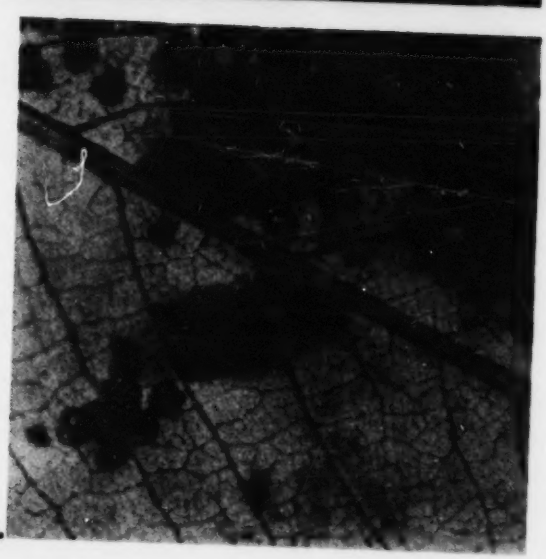
2.



3.



4.



5.

1. European spruce sawfly (*Gilpinia hercyniae* [Htg.]) feeding among white spruce needles
2. Jack pine sawfly (*Neodiprion pratti paradoxicus* Ross) displaying two rows of black dorsal-lateral spots
3. The beech scale (*Cryptococcus fagisuga* Lindinger) displays its white wool-like wax covering while feeding through small cracks made in the bark by feeding tubes called stylets.
4. White spruce cones: the cone on the left is undamaged, but the two smaller cones have been damaged by insects.
5. Feeding damage to willow caused by the larvae of the imported willow leaf beetle (*Plagiodera versicolora* [Laich.])

Table 9. Summary of jack pine sawfly evaluations in seven plantations in the Eastern Region (evaluations based on the examination of 150 trees).

Location (Twp)	Host	Avg ht of trees (m)	Estimated trees per ha	Estimated area affected (ha)	Trees affected (%)	Avg defoliation per affected tree (%)
Brockville District						
Augusta and Escott	JP	1.9	1,850	3.0	100	77
Carleton Place District						
Nepean	JP	3.2	2,450	11.0	9	10
Bathurst	JP	1.3	1,100	3.5	1	3
Gloucester	JP	1.2	325	1.0	9	3
Cornwall District						
Mountain	JP	2.1	1,100	2.0	40	12
Tweed District						
Hungerford	JP	2.6	1,250	7.0	28	31

Scattered trees, primarily maple and basswood (*Tilia americana* L.) regeneration, were 10-25% defoliated over an area of approximately 20 ha along Lanark County Road #9 in Ramsay and Lanark townships, Carleton Place District.

Maple Leafcutter, *Paraclemensia acerifoliella* (Fitch)

There was a slight increase over 1986 population levels, with mostly low numbers being detected in sugar maple throughout the region.

High population levels and severe defoliation were found in Brockville District, where 18-m-high trees in 20 ha of sugarbush in Oxford on Rideau Township (near Farmers Union) sustained 80% foliar damage and displayed premature browning. Two stands of regeneration and codominant sugar maple on 13 ha in Rear of Yonge and Escott and Front of Escott townships also sustained severe defoliation.

Near Hopetown in Lanark Township, Carleton Place District, 24-m-high trees in a 4-ha sugarbush sustained 80% foliar damage. Regeneration 2 to 5 m tall sustained similar damage over an area of 2 ha near Feldspar in South Sherbrooke Township (see photo page).

Light (< 10%) defoliation of occasional trees was observed in regeneration maples in Presqu'ile Provincial Park, Napanee District, and in Sharbot Lake Provincial Park, Tweed District.

Minor Insects

Maple Trumpet Skeletonizer, *Epinotia aceriella* (Clem.)

Overall population levels remained low, and damage was recorded only in Napanee and Brockville districts.

In Napanee District, approximately 10 ha of regeneration and codominant sugar maple ranging from 2 to 20 m sustained 85% foliar damage in Presqu'ile Provincial Park. Similar damage occurred on 2 ha of sugarbush in Hallowel Township, where 25% of the 16-m trees were 65% defoliated.

Light defoliation (< 10%), primarily of roadside maple regeneration, was recorded in both Rear of Yonge and Front of Escott townships, Brockville District.

Sugar Maple Borer, *Glycobius speciosus* (Say)

This insect, which is sometimes a serious pest in uneven-aged sugar maple stands, was assessed in seven stands through the region. Assessments revealed levels of damage ranging from 1 to 7% (Table 10).

Table 10. Summary of sugar maple borer assessments at seven locations in the Eastern Region in 1987 (counts based on the examination of 150 trees at each location).

Location (Twp)	Host	Avg ht of trees (m)	Estimated trees per ha	Estimated area affected (ha)	Trees affected (%)
Brockville District					
Oxford on Rideau	sM	24	600	10.0	3
Rear of Yonge and Escott	sM	22	700	15.0	3
Rear of Leeds and Lansdowne	sM	30	300	2.0	7
Carleton Place					
Pakenham	sM	25	500	5.0	1
Nepean	sM	20	600	5.0	6
Napanee District					
Brighton	sM	21	450	8.0	3
Seymour	sM	22	550	2.0	1

The heaviest damage was recorded in a 2.0-ha stand of 30-m sugar maple near Charleston Lake in Rear of Leeds and Lansdowne Township, Brockville District, where 7% of the trees sustained borer damage. Another stand of 20-m sugar maple in Nepean Township, near Stony Swamp in Carleton Place District, sustained 6% damage.

Eastern Tent Caterpillar, *Malacosoma americanum* F.

This pest, which was generally distributed throughout the region again in 1987, was found defoliating apple (*Malus* spp.) and cherry trees.

The highest density of tents was noted in the Kaladar area of Tweed District, where roadside hosts contained as many as 12 tents per tree and sustained as much as 100% defoliation (see photo page).

Elsewhere, multiple tents could be observed causing 10 to 50% defoliation on single host trees and scattered along hedgerows and roadsides through the region.

Imported Willow Leaf Beetle, *Plagiodera versicolora* (Laich.)

High levels of severe foliar browning were evident in 1987, particularly along the St. Lawrence River and many of its major tributaries. Approximately 3 ha of streamside willow (*Salix* spp.) trees exhibited up to 85% foliar damage in Brighton Township, Napanee District. Mature shoreline trees along 1 km of the Trent River in Trenton displayed similar damage.

Elsewhere, severe defoliation of single trees was evident in Sharbot Lake Provincial Park, Tweed District; in Gloucester Township, Carleton Place District; and along the Ottawa River shoreline in North Hawkesbury Township, Cornwall District (see photo page).

Willow Flea Weevil, *Rhynchaenus rufipes* (LeC.)

This pest, in conjunction with the imported willow leaf beetle, caused severe foliar damage. Severe foliar browning of 100% of single ornamental willow trees was observed in the municipalities of Kemptville, Ottawa, Morrisburg, Cornwall, Smiths Falls, Perth, Kingston, Picton, Trenton and Tweed.

Table 11. Other forest insects.

Insect	Host(s)	Remarks
Altica (=Macrohaltica) populi Brown	bPo	Large populations caused 100% foliar browning or occasional trees throughout the region.
Altica sp. near *carinata* Germ. Flea beetle	wE	30% of each of six 3-m-tall trees skeletonized in Frontenac Prov. Park, Napanee District
Anoplonyx luteipes Cress. Threelined larch sawfly	tL	approximately 3% foliar damage to 13% of a 10 ha seed production area in Montague Township, Carleton Place District
Aphrophora cribrata (Wlk.) Pine spittlebug	wP	90% of the branch tips on five 3-m trees affected in Gloucester Twp, Carleton Place District

(cont'd)

Table 11. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Archips cerasivoranus (Fitch) Uglynest caterpillar	Se	occasional tents observed scattered along concession VI, Oxford on Rideau Twp, Brockville District
Argyresthia thuiella (Pack.) Arborvitae leafminer	eC	light populations with 2-3 mines per branchlet in a 6-ha area near Dwyer Hill in Marlborough Twp, Carleton Place District; similar light populations observed in 16-m-tall windbreak trees at the G. Howard Ferguson Nursery in Kemptville
Argyrotaenia juglandana (Fern.) Hickory leafroller	sHi	This leafroller affected 2% of the foliage on 15-20 mature trees in Frontenac Prov. Park, Napanee District.
Caliroa sp. prob. *fasciata* (Norton) Oakslug sawfly	rO	50% defoliation of three 2-m trees near Bishops Corners, Kaladar Twp, Tweed District
Cameraria hamadryadella (Clem.) Solitary oak leafminer	wO	100% foliar browning of occasional mature trees in Elizabethtown Twp, Brockville District, and Cramahe Twp, Napanee District
Cecidomyia sp. Gall midge	wO	A single tree had 90% of its foliage affected in Rear of Leeds and Lansdowne Twp, Brockville District.
Coleophora laricella (Hbn.) Larch casebearer	tL	Sandbanks Prov. Park, Napanee District, contained three ornamentals with an average of 26 larval cases per branch. Foliage turned brown as a result.

(cont'd)

Table 11. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Coleophora pruniella Clem. Cherry casebearer	wB	Sandbanks Prov. Park contained occasional regeneration with 10% foliar browning.
Coleophora ulmifoliella McD. Elm casebearer	wE	foliar damage to 90% of two trees in Hungerford Twp, Tweed District; damage occasionally observed along Hwy 2 near Gananoque
Coleotechnites laricis (Free.) Casebearer	tL	roadside regeneration with 90% foliage affected along Hwy 16 in Edwardsburgh Twp, Brockville District
Corythucha sp. Lace bug	wE bW	discoloration of foliage of elm regeneration and mature willow trees in Edwardsburgh and Rear of Leeds and Lansdowne twps, Brockville District; upwards of 90% of the foliage affected
Corythucha juglandis Fitch Walnut lace bug	Bu, Wa	In Silver Lake Prov. Park there was a yellow foliar discoloration over 100% of the hosts in a 0.5-ha area. Similar damage occurred to six trees in Sharbot Lake Prov. Park.
Craterocerus sp. prob. *fraternalis* Nort. A sawfly	wO	commonly observed throughout Silver Lake Prov. Park, Carleton Place District, at low levels (10%)
Cryptococcus fagisuga Lindinger Beech scale	Be	commonly found through a 2-ha area, with two trees 20% affected along the St. Lawrence River near Gananoque, Brockville District (This is the first time the insect has been recorded in the Eastern Region.)

(cont'd)

Table 10. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Dasineura gleditschiae O.S. Honey locust podgall midge	Lo	Leaf-curling occurred on 50 to 100% of the foliage on 12 roadside ornamental trees along Hwy 401 in Ernestown Twp, Napanee District.
Dendroctonus valens Lec. Red turpentine beetle	rP	Large populations of the insect affected approximately 30 18-m-tall trees that had been struck by lightning in Kennebec Twp, Tweed District.
Diprion similis (Htg.) Introduced pine sawfly	wP	Two 2-m-tall trees were 60% defoliated in Frontenac Prov. Park.
Elaphidionoides parallelus (Newm.) Hickory twig pruner	bHi, rO	Branch flagging to 8% of two hickory trees occurred in a picnic area in Kennebec Twp, Tweed District, and to 25% of eight 15-m-tall oak trees in Frontenac Prov. Park, Napanee District.
Endothenia albolineana (Kft.) Spruce needleminer	wS	Four 2-m-tall trees scattered through Sandbanks Prov. Park, Napanee District, were 40% defoliated.
Epinotia timidella Clem. Oak trumpet skeletonizer	bO	This leafminer affected 25% of the trees in a 0.5-ha area at low (< 10%) levels in Cramahe Twp, Napanee District.
Fenusa dohrnii (Tischb.) European alder leafminer	spAl	Roadside bushes in the Gloucester area of Carleton Place District were 90% defoliated and the leaves that remained were discolored.

(cont'd)

Table 11. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Fenusa ulmi Sund. Elm leafminer	wE	This leafminer affected 90% of occasional roadside bushes in Charleston Lake Prov. Park, Brockville District.
Lepidosaphes ulmi (L.) Oystershell scale	wE	A single recently dead tree was found covered with this insect in Hungerford Twp, Tweed District.
Messa nana (Klug.) Early birch leaf edgeminer	wB	Mining activity was common at low levels (5%) on most trees in Sharbot Lake Prov. Park, Tweed District.
Neodiprion pinetum (Nort.) White pine sawfly	wP	approximately 40% of a single 1.5-m-tall tree defoliated in Pittsburgh Twp, Napanee District
Nymphalis antiopa (L.) Spiny elm caterpillar	tA	Occasional colonies defoliating 60 to 100% of single roadside trees were observed in Lavant Twp, Carleton Place District.
Phratora purpurea purpurea Brown Aspen skeletonizer	tA	This beetle caused 20 to 50% defoliation of the regeneration through a 2 ha area in Oxford on Rideau Twp, Brockville District.
Physokermes piceae (Schr.) Spruce bud scale	wS	A hedgerow of 1.5-m-tall trees displayed 20% defoliation in Murphy's Point Prov. Park, Carleton Place District.
Pikonema dimmockii (Cress.) Greenheaded spruce sawfly	wS	Murphy's Point Prov. Park contained nine 4-m-tall trees with an average of 56% defoliation.

(cont'd)

Table 11. Other forest insects (concl.).

Insect	Host(s)	Remarks
Pissodes strobi (Peck) White pine weevil	wP	In a 20-ha plantation in Madoc Twp, Tweed District, approximately 32% of the 1.8-m-tall trees were affected. OMNR provided assistance to the landowner by pruning weevilled leaders. The 2-m-tall trees in a 5-ha plantation in Darling Twp, Carleton Place District sustained 6% weevil damage.
Pristiphora erichsonii (Htg.) Larch sawfly	jL	In a seed production area in Montague Twp, Carleton Place District, 2% of the 3-m-tall trees had an average of two colonies per tree.
Scolioneura betuleti (Klug) A birch leafminer		High levels of leafmining occurred on three lakeshore trees at Presqu'ile Prov. Park. This represents an extension of the range of this insect in Ontario.
Sparganothis acerivorana Mack. Maple leafroller	sM	This pest was common along Concession V in Ramsay Twp, Carleton Place District, where approximately 50% of the trees affected averaged 10 rolls per branch.
Tethida cordigera (Beauv.) Blackheaded ash sawfly		This insect was observed at low levels throughout the region except in Frontenac Prov. Park, where 55% of two 6-m-tall trees were defoliated.

TREE DISEASES

Major Diseases

Sclerroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard

Since 1978, intensive surveys have been conducted through the region for the North American race and the more virulent European race of this disease. In 1987, 31 red pine and Scots pine plantations (Fig. 5), including the 20 semipermanent locations established in 1980, were surveyed for signs and/or symptoms of this disease. At least 500 host trees per location were checked. Aerial surveys were also conducted and additional ground checks were made in all suspect areas. The results of all these surveys were negative: neither race of the fungus was detected in the region in 1987.

Because of the increase in infected sites in the neighboring Algonquin Region and in the province of Quebec, attention will be focused on bordering areas during 1988 surveys.

Anthracnose Diseases of Hardwoods, *Apiognomonia errabunda* (Roberge) Höhnel, *Aureobasidium apocryptum* (Ell. & Ev.) Hermanides-Nijhof, *Gnomonia caryae* Wolf var. *caryae*, *Gnomonia leptostyla* (Fr.) Ces. & de Not.

Leaf anthracnose caused by *A. apocryptum* was observed on sugar maple, where it produced brown necrotic margins surrounding green healthy tissue, similar to the symptoms of leaf scorch (see photo page). This foliar disease was commonly observed affecting 20 to 80% of single trees in Kennebec and Anglesea townships, Tweed District, in Brighton Township near Hilton, Napanee District; at various locations in Darling, Ramsay and Lanark townships, Carleton Place District, and south of Kemptville in Oxford on Rideau Township, Brockville District.

A. errabunda caused black foliar lesions affecting up to 50% of the foliage on 20 to 30% of the basswood regeneration along 10 km of Concession V in Kaladar Township, Tweed District.

Walnuts (*Juglans* spp.) and butternuts (*Caryae* spp.) were commonly infected with *G. leptostyla* and *G. caryae* Wolf var. *caryae* throughout Tweed, Napanee and Brockville districts. The resultant brown and black foliar lesions sometimes caused a yellow discoloration of healthy leaf tissue, and infection levels ranged from 5 to 100% on occasional roadside trees.

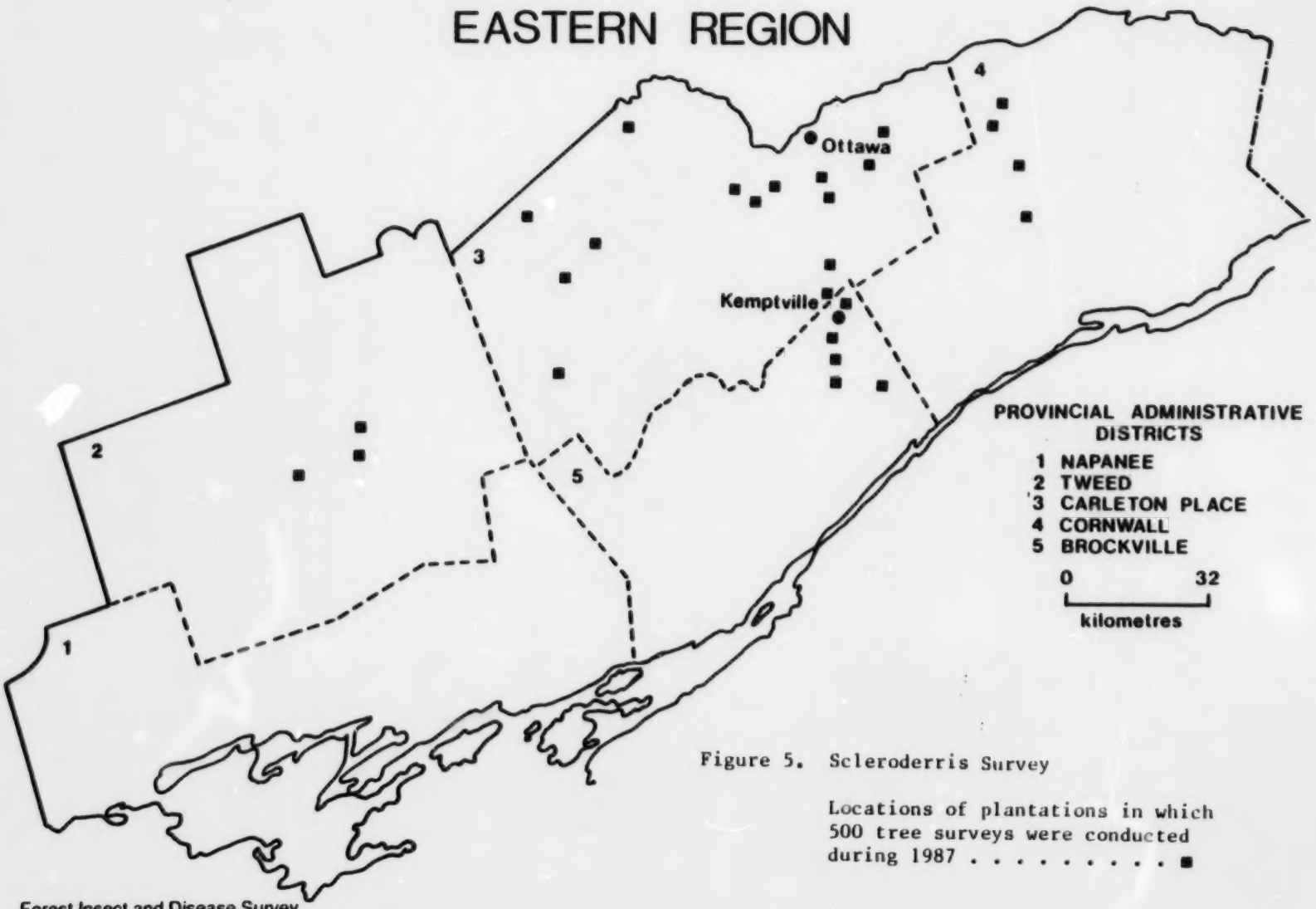


Figure 5. Scleroderris Survey

Locations of plantations in which 500 tree surveys were conducted during 1987 . . . . . ■

Eutypella Canker, *Eutypella parasitica* Davidson & Lorenz

This perennial canker is found commonly on sugar and red maple and infrequently on most other maple species in Ontario (see photo page). Seven sugar maple stands were evaluated for this disease in 1987 in the Eastern Region (Table 12). All stands examined contained stem-cankered trees.

Two separate stands found in Nepean Township, Carleton Place District, and Rear of Leeds and Lansdowne Township, Brockville District, contained the highest levels of severely cankered trees (seven trees or 4.7%, in Nepean Township, and 11 trees, or 7.3%, in Rear of Leeds and Lansdowne Township). Both stands also contained single dead trees with stem cankers. In the five remaining stands examined there were two to four cankered trees per stand.

Minor Diseases

Balsam Poplar Leaf Diseases, *Marssonina populi* (Lib.) Magnus,
Marssonina populorum G.E. Thompson,
Mycosphaerella populicola G.E. Thompson,
Mycosphaerella populorum G.E. Thompson

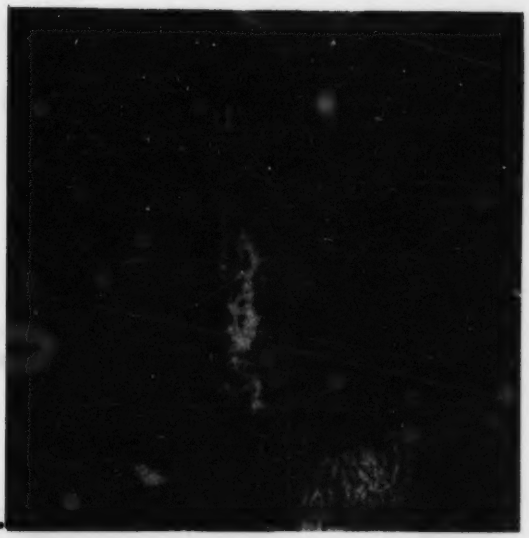
Once again a variety of leaf diseases caused discoloration and premature leafdrop among balsam poplar (*Populus balsamifera* L.) throughout the region. Areas in which 90 to 100% leaf loss was observed in early September were reported in Denbigh, Olden, and Kaladar townships, Tweed District. Lower infection levels ranging from 10 to 20% were commonly encountered throughout the remainder of the region (see photo page).

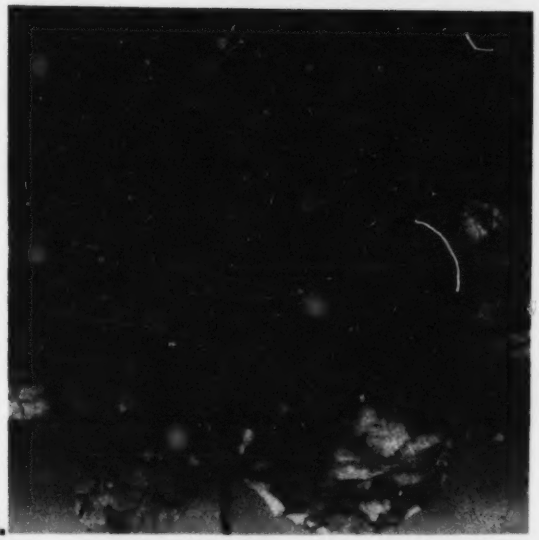
Leaf Spot Diseases, *Mycosphaerella effigurata* (Schw.) House,
Stegophora ulmea (Schw.:Fr.) Sydow & Sydow

These foliar diseases were evident throughout all districts at various levels of intensity. Generally they affected < 10% of roadside trees of all sizes.

There was a higher incidence of *M. effigurata* near Fallowfields in Nepean Township, Carleton Place District, where 90% of a 10-ha area of ash (*Fraxinus* spp.) displayed symptomatic brown lesions on 10% of the foliage. Approximately 50% of a 0.5-ha area of roadside ash along hwys 41 and 7 in Tweed District was similarly affected. Another 2.0-ha area of regeneration sustained 50% foliar damage in North Elmsley Township, Carleton Place District.

S. ulmea was observed on elm (*Ulmus* spp.) in North Plantagenet Township, Cornwall District, where 80% of host foliage was affected over a 2.0-ha area. Foliar damage of 50% occurred to 90% of the elm trees along 10 km of Concession V in Kaladar Township, Tweed District.





1. Eutypella canker (*Eutypella parasitica* Davidson & Lorenz) severely damaging a sugar maple tree
2. Nectria canker (*Nectria galligena* Bresad.) on sugar maple, giving it a target-like appearance.
3. Anthracnose (*Discula* spp.) causing brown lesions in leaf tissue
4. Septoria leaf spot (*Mycosphaerella populicola* G. E. Thompson) on balsam poplar: Note symptomatic black lesions.
5. White pine blister rust (*Cronartium ribicola* J. C. Fischer) on sapling: Note orange aecia, which have ruptured the bark.

Table 12. Summary of Eutypella canker surveys conducted at seven locations in the Eastern Region in 1987 (data based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host	Avg DBH (cm)	Avg tree height (m)	Estimated area affected (ha)	Estimated host trees per ha	No. of trees cankered		No. of dead trees with cankers
						Total	%	
Brockville District								
Oxford on Rideau	sM	40	24	7	600	2	1.3	0
Rear of Yonge and Escott	sM	37	22	5	700	4	2.7	0
Rear of Leeds and Lansdowne	sM	55	30	2	300	11	7.3	1
Carleton Place District								
Pakenham	sM	40	25	5	500	2	1.3	0
Nepean	sM	40	20	5	600	7	4.7	1
Napanee District								
Brighton	sM	38	21	8	450	2	1.3	0
Seymour	sM	45	22	2	550	4	2.7	0

Table 13. Other forest diseases.

Organism	Host(s)	Remarks
Armillaria mellea (Vahl:Fr.) Kummer Armillaria root rot	rP	six 21-m-tall trees found newly dead around a 0.3-ha pocket of previously dead trees in a 6-ha plantation located in Gloucester Twp, Carleton Place
Asteroma microperum (Peck) B. Sutton Leaf spot	Ba	Curled necrotic leaf edges that affected up to 100% of single trees were observed through the Tweed District, particularly in Kennebec Twp.
Ceratocystis ulmi (Buism.) C. Moreau Dutch elm disease	wE	Roadside evaluations disclosed infection levels ranging from 2% in Sydney and Thurlow twps, Napanee District, to 23% in Elmsley and Montague twps, Carleton Place District. Counts were based on the examination of 100 trees.
Cladosporium sp. A leaf spot	bO	30% of foliar browning on three 12-m-tall trees in a 2 ha plantation located in Gloucester Twp, Carleton Place District
Ciborinea whetzellii (Seaver) Seaver Ink spot of aspen	tA	Small areas contained 5 to 10 young trees with up to 20% foliar browning in Kaladar Twp, Tweed District.
Coleosporium asterum (Dietel) Sydow Pine needle rust	rP, jP	Infection levels continued to be low through the region. In a 1-ha area of red pine in Ramsay Twp, Carleton Place District, 96% of the 0.5-m-tall trees exhibited an average of 5% foliar damage. In Darling Twp, Carleton Place District, 9% of the 2-m-tall jack pine in a 2-ha area exhibited 2% foliar damage over 9% of the trees.

(cont'd)

Table 13. Other forest diseases (cont'd).

Organism	Host(s)	Remarks
Cronartium ribicola J.C. Fischer White pine blister rust	wP	Approximately 10% of 1000 young 1.5-m-tall trees were infected with branch and stem cankers in North Gower Twp, Carleton Place District (see photo page).
Discula sp. Anthracnose	sM	Foliar browning affected the lower 30% of mature roadside trees and 90% of regeneration along 0.7 km of Concession V in Front of Yonge Twp, Brockville District (see photo page).
Endocronartium harknessii (J.P. Moore) Y. Hirats. Western gall rust	ScP	2% of a 0.5-ha area contained scattered trees with up to 10% branch infection in Oxford on Rideau Twp, Brockville District
Gymnosporangium globosum Farlow Globose gall rust	rJ	galls easily visible on 19% of 1000 roadside trees, and an average of 6% branch infection in Thurlow Twp, Napanee District
Gymnosporangium juniperi-virginianae Schwein. Cedar-apple rust	rJ	Scattered trees over 1.0 ha near an apple orchard in Front of Yonge Twp, Brockville District averaged 3 galls per branch.
Isthmiella faullii (Darker) Darker Needle cast	bF	foliar browning on 20% of the lower crowns of three trees observed in Denbigh Twp, Tweed District
Lirula nervata (Darker) Darker Needle cast	bF	Up to 90% of the old foliage on 12 roadside trees in Lavant Twp, Carleton Place District, contained infections.

(cont'd)

Table 13. Other forest diseases (concl.).

Organism	Host(s)	Remarks
Melampsora medusae Thüm. Larch-poplar rust	tL	This needle cast affected the lower 30% of six ornamental trees near Burritt's Rapids, Carleton Place District.
Septoria betulae Pass. Leaf blight	wB	Trees in approximately 2 ha in North Plantagenet Twp, Cornwall District displayed severe foliar browning over 100% of the foliage. Single scattered trees revealed similar damage at many points through the region.
Sphaeropsis sapinea (Fr.) Dyko & B. Sutton Tip blight	Austrian pine, rP	In Sandbanks Prov. Park, 40 to 50% of the lower branches on 18 trees were infected and dying. In Presqu'ile Prov. Park, similar damage was noted on eight lakeshore trees. This disease has been responsible for low levels of damage on ornamentals at various locations in the city of Ottawa.
Tubakia dryina (Sacc.) B. Sutton Leaf spot	wO	Approximately 200 trees scattered over 2 ha of pasture exhibited 80% foliar browning in Wolford Twp, Brockville District.

DIEBACKS AND DECLINES

Maple Dieback Survey

Special surveys were performed at 10 randomly selected sugar maple stands in Carleton Place, Brockville and Napanee Districts (Fig. 6). These plots, in conjunction with 10 additional stands to be marked in 1988, are established semipermanently and will be continually monitored for such variables as branch mortality, pests, defects, and growth.

This year's assessments disclosed that 90% of 250 trees examined contained 0 to 5% current branch mortality ('0' class, Table 14). The remaining 10% of the trees contained branch dieback in the 6 to 20% range. Cumulative branch mortality (> 5%) was evident on 71% of trees examined (see photo page).

Oak Decline

Two red oak plots established in 1977 in Lavant Township, Carleton Place District, have been examined and rated annually for crown deterioration over the past decade. Each plot contains 100 tagged trees that are rated for crown dieback, crown class, crown condition, foliar and stem insect and disease damage, stem decay, and abiotic damage. Decline estimates are made visually according to classes of branch-tip and whole-branch mortality. These classes range from 0 to 5 (Table 15) and are used for estimating both current and cumulative mortality, the latter having being rated since 1984.

As Table 15 indicates, most tree crowns were rated in classes 0 to 3 (0-60% current mortality). The highest number of trees fell in classes 0 and 2 in both plots. Cumulative branch mortality was highest, on average, in classes 1 and 2, or between 6% and 40%, at both locations.

Tree mortality at both plots averaged 1%, or one tree per annum. Defoliation by the gypsy moth averaged 18% (range 5-50%) at Plot 1. At Plot 2 defoliation was minimal (avg at both locations < 5%). Total dieback appears to have increased in classes 1 and 2 and decreased slightly in classes 3 and 4.

ABIOTIC DAMAGE

Frost Injury

Above-average temperatures during April, 1987 (more than 4°C above normal - Ottawa International Airport) caused an acceleration of new foliage development in most tree species. This was followed by freezing overnight temperatures ranging from 0°C to -5°C between 2 and 4 May; the result was widespread frost damage throughout the region (Table 16.).

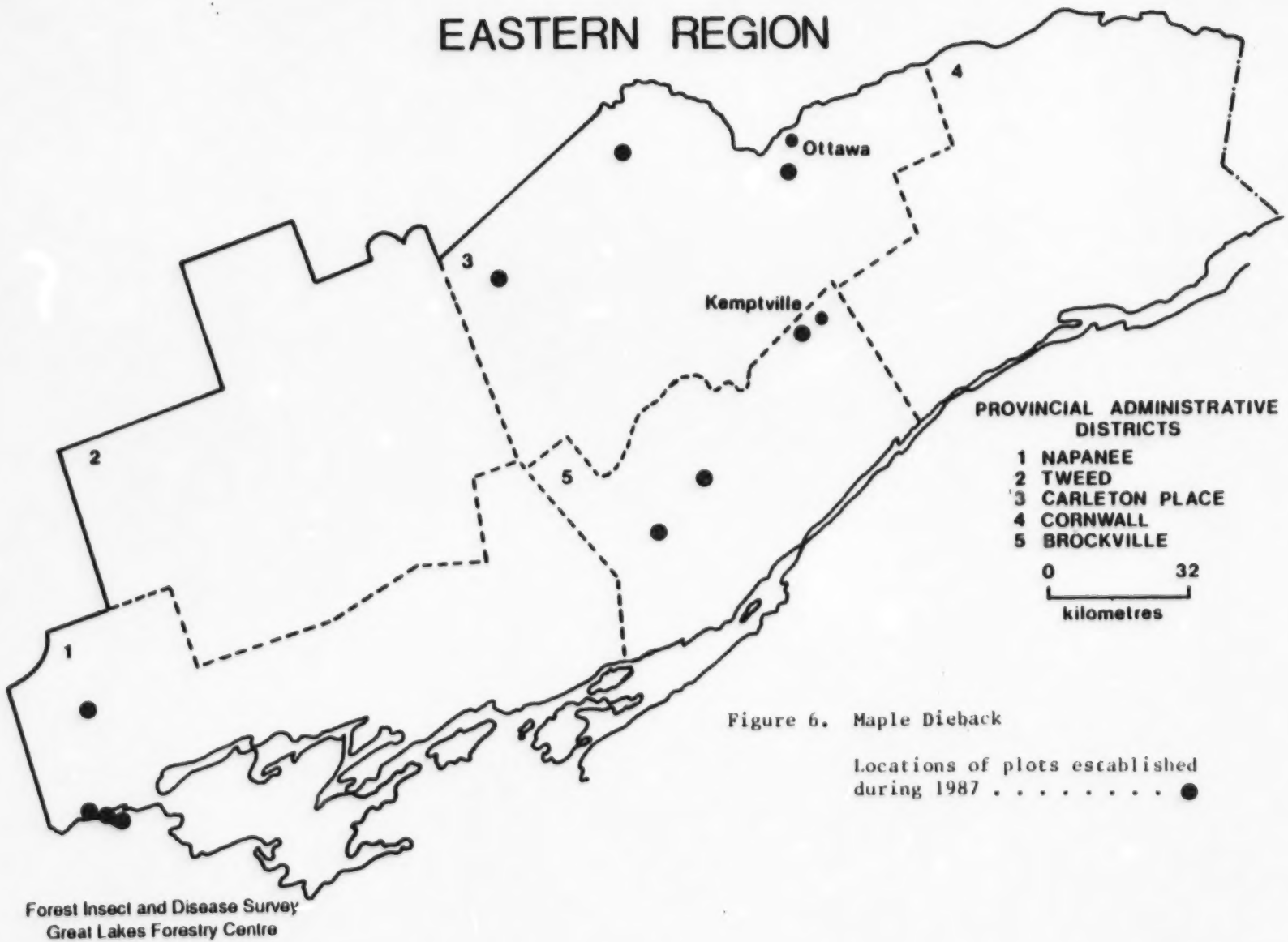


Figure 6. Maple Dieback

Locations of plots established during 1987 . . . . . ●

Table 14. Summary of the 1987 results from 10 plots established to monitor sugar maple decline in the Eastern Region (data based on the examination of a minimum of 25 host trees per location).

Location (Twp)	Avg DBH (cm)	Avg height (m)	Estimated stand area (ha)	Estimated no. of host trees per ha	No. of trees with crown dieback[a]											
					Current						Cumulative					
					0	1	2	3	4	5	0	1	2	3	4	5
Brockville District																
Oxford on Rideau	35.6	24	15	425	21	4	0	0	0	0	12	13	0	0	0	0
Rear of Leeds and Lansdowne	66.4	28	2	400	21	4	0	0	0	0	16	8	1	0	0	0
Rear of Yonge and Escott	33.6	21	30	530	23	2	0	0	0	0	18	7	0	0	0	0
Carleton Place District																
Nepean	37.1	20	4	500	23	2	0	0	0	0	23	2	0	0	0	0
Pakenham	50.5	25	15	550	22	3	0	0	0	0	12	11	2	0	0	0
Lavant	37.6	22	20	380	19	6	0	0	0	0	16	8	1	0	0	0
Napanee District																
Brighton	40.0	20	1	200	23	2	0	0	0	0	14	11	0	0	0	0
Brighton	44.0	21	1	280	24	1	0	0	0	0	20	4	1	0	0	0
Brighton	42.0	20	2	300	25	0	0	0	0	0	23	2	0	0	0	0
Cramahe	36.0	18	2	650	25	0	0	0	0	0	24	1	0	0	0	0

[a]Dieback classification: 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = > 61%, 5 = dead tree

Table 15. A 10-year summary of data collected from two red oak decline plots established in 1977 in Carleton Place District of the Eastern Region (based on the examination of 100 tagged trees per location).

Location	Avg DBH of trees (cm)	Stand size (ha)	Year	Current Dieback Classes[a]						Cumulative Dieback Classes[b]					
				0	1[c]	2	3	4	Trees Dead	0	1	2	3	4	Trees Dead
Carleton Place District															
Lavant Twp. - Plot 1 Joe Lake	24.0	40.0	1977	-	46	38	12	4	0	-	-	-	-	-	0
			1978	-	21	59	13	7	0	-	-	-	-	-	0
			1979	-	5	51	32	8	4	-	-	-	-	-	4
			1980	-	7	41	36	11	1	-	-	-	-	-	5
			1981	-	11	33	37	12	2	-	-	-	-	-	7
			1982	-	6	32	40	15	2	-	-	-	-	-	7
			1983	-	7	33	40	13	2	-	-	-	-	-	7
	26.3		1984	10	51	20	6	6	0	0	26	43	15	5	7
			1985	36	35	14	7	1	0	0	26	47	15	5	7
	26.5		1986	43	35	11	1	0	3	0	30	42	12	6	10
			1987	68	30	2	0	0	1	3	40	32	11	3	11
Lavant Twp. - Plot 2 Flower Station	19.0	15.0	1977	-	28	50	11	1	0	-	-	-	-	-	0
			1978	-	14	72	10	4	0	-	-	-	-	-	0
			1979	-	5	73	18	2	2	-	-	-	-	-	2
			1980	-	2	53	33	7	3	-	-	-	-	-	5
			1981	-	2	41	40	8	4	-	-	-	-	-	9
	20.0		1982	-	0	40	41	10	0	-	-	-	-	-	9
			1983	-	0	49	31	10	1	-	-	-	-	-	10
	21.4		1984	19	48	18	3	2	0	0	19	49	19	3	10
			1985	48	37	3	0	2	0	0	31	47	11	1	10
	21.9		1986	42	39	7	0	0	1	0	39	43	4	2	11
			1987	66	20	3	0	0	0	6	51	25	3	4	11

[a] 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = > 61%
[b] cumulative classification not estimated prior to 1984
[c] 1977-1983 Class 1 = 0-20% at both plots

Table 16. Summary of damage caused by frost in the Eastern Region during 1987 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Trees affected (%)	Current foliar damage (%)
Carleton Place District						
Gloucester	wS	0.5	600	1.5	75	2
Gloucester	wS	2.1	2000	26.0	41	2
Dalhousie	wS	3.4	2450	10.5	71	3
Nepean	wS	6.5	1050	4.0	46	2
Darling	Bd	13.0	100	1.0	2	2
Cornwall District						
North Plantagenet	wS	2.0	1250	3.0	100	90
Cambridge	wS	2.0	2000	7.0	100	98
North Plantagenet	wS	6.0	500	6.0	80	2
Brockville District						
Front of Leeds and Lansdowne	wS	1.8	600	1.0	93	7
Oxford on Rideau	wS	0.5	1000	1.0	2	2

Severe damage occurred to 100% of the trees in two white spruce (*Picea glauca* [Moench] Voss) plantations in Cornwall District. Near Benoit, in Cambridge Township, 98% of the new foliage was lost over 7.0 ha and 90% damage occurred over 3 ha near Pendleton in North Plantagenet Township.

Elsewhere, low levels of damage ranging from 2 to 7% were noted, primarily on white spruce and basswood growing low lying sites (see photo page).

Snow and Ice Damage

Heavy snow and ice storms early in 1987 caused severe damage to trembling aspen and birch stands at different locations in Brockville and Cornwall districts. Most damage occurred to stand edges and open/exposed fringe trees, which were badly bent or which contained broken branches within the crowns. Damaged areas up to 0.5 ha were evident near the Ottawa International Airport and along Hwy 401 between Cornwall and Kingston.

Drought

Record high temperatures and low precipitation levels during July and August (cf. Tables 19 and 20) produced premature discoloration, leaf wilt and leaf curl, primarily on deciduous trees on hilltops, near rock exposures and in generally shallow soils. The largest areas of foliar damage occurred in Wolford and North Gower townships, Carleton Place District. In Tweed District, many hilltop stands in Oso, Barrie, and Anglesea townships were also affected.

SPECIAL SURVEYS

White Spruce Plantations

In 1987 special surveys were conducted in six plantations in the region to identify and assess the types of pest problems and any consequent impact on host trees (Fig. 7). Two plantations were randomly selected from each of the following height classes: 0.5 m - 2.0 m, 2.1 m - 6.0 m and > 6.0 m. At each plantation 150 trees were examined between 8 and 27 June and again between 13 and 24 July. The stands were assessed for the presence of the following insects, diseases and abiotic damage (results are presented in Table 17):

Insects: spruce budworm, spruce coneworm (*Dioryctria reniculelloides* Mut. & Mun.); a coneworm (*Zeiraphera* sp.), yellow-headed spruce sawfly, white pine weevil

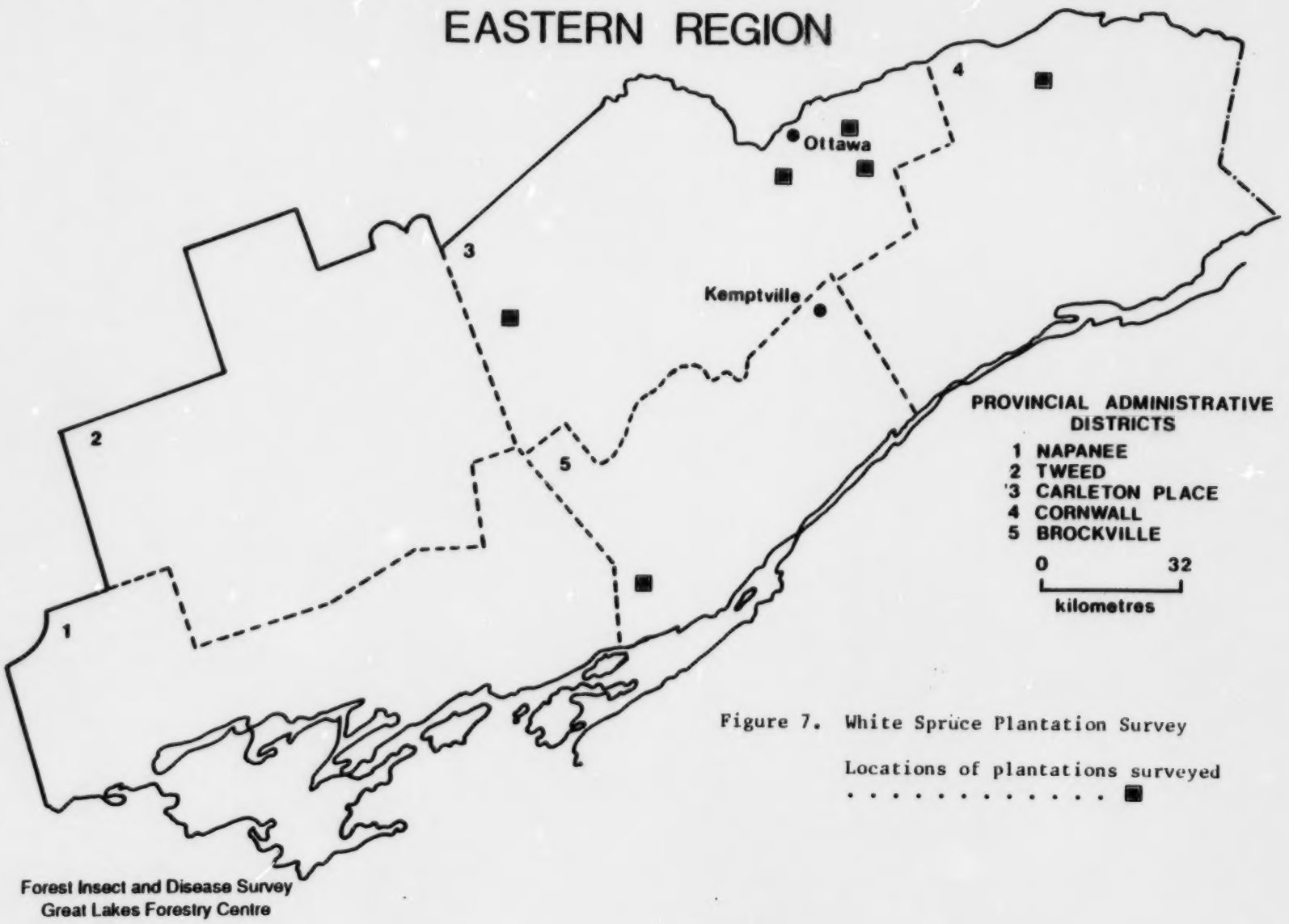


Figure 7. White Spruce Plantation Survey

Locations of plantations surveyed . . . . . ■

Table 17. Summary of the results of white spruce plantation surveys conducted at six randomly selected locations across the Eastern Region in 1987 (counts based on the examination of 150 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Yellow-headed spruce sawfly		*Zeiraphera* spp.		European spruce sawfly	
				Trees affected (%)	Defoliation (%)	Trees affected (%)	Defoliation (%)	Trees affected (%)	Defoliation (%)
Carleton Place District									
Gloucester	1.5	600	0.5	0	0	0	0	0	0
Gloucester	26.0	2000	2.1	0	0	19	1	1	1
Dalhousie	10.5	2450	3.4	12	1	6	1	9	1
Nepean	4.0	1050	6.5	3	1	0	0	0	0
Brockville District									
Front of Leeds and Lansdowne	1.0	600	1.8	7	1	39	1	11	1
Cornwall District Twp.									
North Plantagenet	6.0	500	7.0	3	1	8	2	0	0
Carleton Place District									
Gloucester	1.5	600	0.5	75	2	0	0	4	4	0
Gloucester	26.0	2000	2.1	41	2	1	1	0	0	0
Dalhousie	10.5	2450	3.4	71	3	2	1	0	0	0
Nepean	4.0	1050	6.5	46	2	0	0	0	0	0
Brockville District									
Front of Leeds and Lansdowne	1.0	600	1.8	93	7	0	0	0	0	0
Cornwall District									
North Plantagenet	6.0	500	7.0	80	2	0	0	0	0	0

1.

2.

3.

4.

5.

1. Frost damage to new growth of white spruce
2. Root rot (*Cylindrocladium floridanum* Sob. & C.P. Seym.) on young white spruce: the cause of fewer roots and stunted root growth
3. Soil sampling on the perimeter of ARNEWS plots
4. Maple decline evident among roadside trees
5. Gypsy moth (*Lymantria dispar* [L.]) pheromone traps with captured moths

Diseases: Armillaria root rot; spruce needle rust (*Chrysomyxa* spp.); spruce broom rust (*Chrysomyxa arctostaphyli* Dietel); eastern dwarf mistletoe (*Arceuthobium pusillum* Peck)

Abiotic damage: Frost

The following is a list of the above mentioned pests not found in the current survey:

Insects: spruce budworm, spruce coneworm and white pine weevil.

Disease: spruce broom rust, eastern dwarf mistletoe and armillaria root rot.

Other pests encountered during the survey were:

Insects: European spruce sawfly (*Gilpinia hercyniae* [Htg.]); redlined conifer caterpillar (*Feralia jocosa* [Gn.]); gypsy moth (*Lymantria dispar* L.)

Diseases: needle rust (*Pucciniastrum* sp.)

Other damage: girdling by rodents

As Table 17 indicates, no serious pests were encountered; however, abiotic damage due to frost was evident in 41-93% of the trees examined. Foliar damage was minimal, ranging from 2 to 7%.

The yellowheaded spruce sawfly was commonly found at various locations, as was the European spruce sawfly (see photo page). A coneworm (*Zeiraphera* sp.) was even more common, but damage levels for all three insects were low (1%).

The European spruce sawfly caused an average of 1% foliar damage to 9% of a 10.5-ha plantation in Dalhousie Township, Carleton Place District, and to 11% of a 1.0-ha plantation in Front of Leeds and Lansdowne Township, Brockville District. The redlined conifer caterpillar, the gypsy moth and the needle rust (*Pucciniastrum* sp.) were found at trace levels in Gloucester and Dalhousie townships, Brockville District. Rodent girdling killed four small trees in Gloucester Township, Brockville District.

Surveys of white spruce plantations in 1981 and 1984 indicated that the spruce budworm and the yellowheaded spruce sawfly were the major defoliators, and caused damage at trace levels. Frost damage also occurred in 1981, at low levels.

White Spruce Cone Collection

Cone-damaging insects and diseases can greatly reduce the numbers of viable seeds available for regeneration. Collections of cones are made each year for analysis of damaging agents in relation to seed yield. A collection of 100 cones was taken from 12-m-high trees in a 0.5-ha plantation located on Davidson Road in Gloucester Township, Carleton Place District.

Of the 100 cones, 95% were damaged by insects (see photo page). Mean seed count in undamaged cones was 49; mean seed count in damaged cones was 31. This represents a 37% decrease in seed production. The agents responsible for the damaged cones are listed in declining order of importance according to the percentage of seed loss: Lepidoptera (damage only), spruce cone maggot (*Lasiomma anthracina* Czerny), spruce seed moth (*Cydia strobilella* [L.]); and the spruce cone gall midge (*Dasineura canadensis* Felt).

G. Howard Ferguson Forest Station

Abnormally warm weather during April followed by freezing temperatures in early May caused the destruction of approximately 1.3 million (50%) of the white spruce transplant seedlings at the nursery.

Other significant problems that occurred over the summer were as follows: root rot (*Cylindrocladium floridanum* Sob. + C.P. Seym.) and *Cylindrocarpon* sp. affected approximately 10% of the Norway spruce (*Picea abies* [L.] Karst.) in Comp. 46; 10% of the red pine in Comp. 22; 10% of the white spruce in Comp. 41 and 20% of the black spruce (*Picea mariana* [Mill.] B.S.P.) also in Comp. 41 (see photo page). *Fusarium* sp. was found to be associated with the above diseases and compartments, as well as Comp. B-14, Comp. 64, and 20 compartments containing young eastern white pine and white spruce.

The larch-poplar rust (*Melampsora medusae* Thüm.) has been a constant problem among the hybrid poplar stool beds over the past few years, and infection levels ranged from 2 to 50% this year. A successful control attempt was made with the fungicide Benlate during the fall of 1986 and infection levels of sprayed stool beds have decreased to < 5%.

Shoot blight (*Venturia macularis* [Fr.] E. Müller & v. Arx) was detected at low levels of infection (2%) on the hybrid poplar in Comp. 66.

Septoria leaf spot (*Mycosphaerella populicola* G.E. Thompson) was evident throughout most poplar beds, with foliar damage ranging from 10 to 25% on 90% of the trees.

Generally low levels of insect activity were evident in the nursery this year. The aspen skeletonizer (*Phratora purpurea purpurea* Brown), poplar-and-willow borer (*Cryptorhynchus lapathi* Linn.), and a flea weevil (*Rhynchaenus* sp.) were evident at low population levels throughout most of the poplar beds. Low populations of the arborvitae leafminers (*Argyresthia* spp. and *Pulicalvaria thujaella*) were evident on occasional windbreak cedar (*Thuja* spp.) trees located around the nursery.

Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

This pest was first recovered from declining trees in four areas of Ontario in 1984. Further sampling and research indicate that there are two principal forms of the nematode, distinguished by anatomical differences. The 'r' form occurs mainly in pine and the 'm' form is usually found in spruce or balsam fir. In order to determine the status of the nematode in Ontario, numerous samples both of trees displaying symptoms of the disease and sawyer beetles (*Monochamus* spp.), which may be vectors of the nematode in Ontario, have been collected by FIDS staff over the past several years. Positive collections of both forms have been made across the province. Active populations were extracted from trees in the Limerick Forest of Brockville District in 1984, and in 1985 positive samples were taken in Oxford on Rideau Township, Brockville District, Denbigh Township, Tweed District, and Fitzroy Township, Carleton Place District.

In 1987, three white spruce from Gloucester Township and three red pine and two eastern white pine from Nepean Township, all in Carleton Place District, were sampled for nematodes. Two samples from Nepean Township, one from red and one from eastern white pine, contained the 'r' form of the nematode. In all samples collected, sawyer beetle activity and/or stained wood were evident. (Both are commonly found in association with the nematode).

In 1988 plots will be established at sites previously identified as having active populations of the pinewood nematode. Adjacent trees will be marked and continually monitored to obtain information on rates and methods of short-range spread.

Beech Bark Disease, *Nectria coccinea* var. *faginata* Lohman, Watson and Ayers.

Beech bark disease has been recorded since the early 19th century in continental Europe and the United Kingdom. In Europe, the disease is a complex of the fungus *Nectria coccinea* and the scale insect *Cryptococcus fagisuga* Lindinger, whereas in North America the fungi involved with the scale insect are *N. galligena* Bresad. and *N. coccinea* var. *faginata*. Heavily localized scale insect attacks predispose bark tissue to subsequent infections of bark-cankering fungi. Therefore, the

spread and development of the disease are largely dependent on *C. fagisuga*. This insect, was introduced to Halifax, Nova Scotia, on beech (*Fagus* spp.) seedlings about 1890. Since then it has spread into New Brunswick, Prince Edward Island and southeastern Quebec, where the northern limit of beech occurs, limited by the northerly range of beech. It has also spread west and south into the northeastern United States. The fungi-insect complex has been documented north to the southern shore of the St. Lawrence River and west to Lake Ontario. The beech scale (see photo page) has been documented by FIDS staff in southern Ontario since 1966 and a collection was identified from the Eastern Region near Gananoque in Brockville District in 1987. Collections of the Nectria fungi that cause beech bark disease may have also been made in 1987 in Presqu'ile Provincial Park, but positive identification has not yet been made. More collections will be made in 1988 to provide taxonomists with the additional material needed to identify the species of *Nectria* involved.

Heavy mortality of beech can occur as a result of either invading fungi or secondary agents such as woodboring insects and white rot fungi.

Over the past few years, special surveys have been conducted by FIDS personnel in at least five mature beech stands throughout the range of beech in an effort to detect either the insect or the fungus.

Acid Rain National Early Warning System (ARNEWS)

The three ARNEWS plots located in sugar maple in Rear of Yonge and Escott Township, Brockville District, white spruce in Gloucester Township, Carleton Place District, and eastern white pine in Hungerford Township, Tweed District, were all resurveyed in 1987. All variables were again examined and the first soil sampling program (see photo page) was undertaken. All results are under investigation and will be presented at a later date.

The Greenbelt Forest of the National Capital Commission (NCC) - Ottawa

Assistance provided to the NCC in the detection and assessment of insect and disease problems in the Greenbelt area involved several successful field trips and meetings with personnel over the course of the 1987 field season. The following is a summary of accomplishments and observations made in the Greenbelt forest in 1987.

In an attempt to verify the status of both present and future populations of the gypsy moth in the Greenbelt area, a small burlap and pheromone trapping program was implemented and monitored by Mr. C. Leger of the NCC. The trapping results (recorded in Table 18) verify the presence of larvae and adults in both areas trapped. Although higher

Table 18. Results of burlap and pheromone trapping for gypsy moth at two locations in the Greenbelt Forest of the National Capital Commission during 1987.

Location	Burlap Traps		Pheromone Traps	
	No. of traps	Presence of larvae	No. of traps	No. of moths captured
Carleton Place District				
Nepean Twp Nepean Tent and Trailer Park	10	Confirmed	3	1,101
Gloucester Twp NCC Field Station	10	Confirmed	2	180

numbers of larvae and adults were captured at the Nepean Tent and Trailer Park the defoliation estimates were light, averaging < 10% on the few oaks growing in the area. Egg-mass surveys at both locations indicate that populations of this insect will remain at very low levels in 1988.

Surveys for the sugar maple borer in the Eastern Region revealed low levels of damage in all areas (see Table 10). The highest level of damage (6%) was recorded in Nepean Township in the Greenbelt forest. This sometimes serious pest can greatly reduce the value of its host by boring across the grain close to the bark, leaving open wounds that can serve as entry sites for secondary insects or diseases that may eventually kill the tree.

Special surveys were conducted in white spruce plantations at three locations in the Greenbelt forest to detect possible insect and disease problems (see Table 17). Low levels of damage (1%), caused primarily by the yellowheaded spruce sawfly (see photo page), a *Zeirophera* sp., and the European spruce sawfly. Frost caused an average of 2% foliar damage to 46-75% of the trees in all three plantations. Needle rust (*Chrysomyxa* spp.) was present at trace levels in 2.1-m-tall trees in Gloucester Township. Rodent damage caused 4% current mortality of 0.5-m-tall trees in a plantation in Gloucester Township. Another plantation not in the survey, located at Walkerly Road and Hwy 417, Gloucester Township, was discovered to have sustained rodent damage on 74% of a 0.5-ha area of 1.0-m eastern white pine. Of the 74% affected, 61% had already succumbed to girdling by the rodents over the previous winter months. As part of the white spruce survey, 100 mature cones were collected and examined for insect and disease damage. The results revealed that a high percentage (95%) of the cones were damaged by insects, reducing the number of viable seeds by 37%. The insects that caused the damage are described on page 43 (see White Spruce Cone Collection).

Ground and aerial surveys were again conducted in various pine plantations for evidence of damage by sclerroderris canker. All suspect pine growing throughout the Greenbelt area were ground-inspected and sampled if necessary. All samples and surveys proved negative.

During surveys for Eutypella canker, a sugar maple stand in Nepean Township was found to have sustained a higher incidence of infection than stands examined during 1987 (i.e., 4.7%, or seven cankered trees [Table 12]).

This same stand was the site of a maple dieback plot established for annual monitoring over the next few years. From the results of dieback surveys in 1987, current and cumulative branch mortality are expected to be low in 1988 (Table 14).

Snow and ice storms caused severe damage, primarily to open and exposed fringe trees along roadsides and stand edges. Mostly aspen and birch trees in the vicinity of the Ottawa International airport sustained broken branches and bent or broken tops.

A stand of 21-m-tall red pine in Gloucester Township that contained a pocket of dead trees was first suspected of being infected with fomes root rot but further investigation revealed that the dead trees were infected with Armillaria root rot. Six dead trees were sampled from a 6-ha plantation and the infected area was estimated to be 0.3 ha in size.

The Acid Rain National Early Warning System (ARNEWS) has plots established throughout Ontario to monitor any changes that may indicate damage attributable to acid precipitation. One plot was established in a white spruce plantation located in the Greenbelt area of Gloucester Township. This plot was reassessed for any detectable changes, soil samples were collected from around the plot area. Only successional changes have been observed on the plot. Aerial photos have been taken each year for further analysis.

Climatic Data

Weather extremes have induced significant abiotic damage by agents such as drought, frost and storms in a number of forested areas in the Region, as noted elsewhere in this report. Climatic anomalies can also induce or reduce such forestry related variables as insect and host growth, overwintering success, insect feeding rates, and spread or containment of diseases, and can even control the amounts of dry and wet acid depositions. For these reasons, mean monthly temperatures and total precipitation figures from two locations in the Eastern Region are recorded and have been presented in Tables 19 and 20.

Table 19. A comparison of 1987 mean temperatures and total precipitation with their normal values (based on a 30-year period) (Figures obtained from the Ottawa International Airport).

Month	Mean temp. 1987 (°C)	Normal temp. (°C)	Deviation from normal temp. (°C)	Total precip. 1987 (mm)	Normal precip. (mm)	Deviation from normal precip. (mm)
Jan.	-9.1	-10.9	+1.8	43.4	61.0	-17.6
Feb.	-9.6	-9.5	-0.1	25.0	60.3	-35.3
Mar.	0.9	-3.0	+3.9	75.2	67.5	+7.7
April	9.9	5.6	+4.3	73.8	69.1	+4.7
May	13.1	12.8	+0.3	67.4	67.9	-0.5
June	18.7	18.0	+0.7	90.4	73.4	+17.0
July	21.9	20.6	+1.3	117.1	85.9	+31.2
Aug.	18.9	19.2	-0.3	36.8	88.4	-51.6
Sept.	14.8	14.3	+0.5	121.6	79.3	+42.3
Oct.	6.4	8.1	-1.7	67.4	68.1	-0.7
Nov.	0.3	1.2	-0.9	116.2	77.7	+38.5
Dec.	-4.0	-7.7	+3.7	79.2	80.7	-1.5

Table 20. A comparison of 1987 mean temperatures and total precipitation with their normal values (based on a 30-year period) (Figures obtained from the Trenton Air Base).

Month	Mean temp. 1987 (°C)	Normal temp. (°C)	Deviation from normal temp. (°C)	Total precip. 1987 (mm)	Normal precip. (mm)	Deviation from normal precip. (mm)
Jan.	-6.0	-7.6	+1.6	57.4	68.9	-11.5
Feb.	-7.1	-6.5	-0.6	20.5	57.0	-36.5
Mar.	1.9	-1.0	+2.9	90.9	72.0	+18.9
April	9.5	6.4	+3.1	93.6	76.1	+17.5
May	14.1	12.5	+1.6	20.2	73.0	-52.8
June	18.9	17.8	+1.1	88.3	63.7	+24.6
July	22.1	20.6	+1.5	33.4	60.9	-27.5
Aug.	19.4	19.7	-0.3	73.5	71.9	+1.6
Sept.	15.5	15.3	+0.2	80.5	72.8	+7.7
Oct.	6.7	9.2	-2.5	48.2	70.1	-21.9
Nov.	2.7	3.2	-0.5	117.4	86.1	+31.3
Dec.	-1.0	-4.5	+3.5	60.0	82.9	-22.9